THE ILLUMINATING ENGINEER

LIGHT
LAMPS
FITTINGS
AND
ILLUMINATION

THE JOURNAL OF
GOOD LIGHTING

OIL
GAS
ELECTRICITY
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PETROL-AIR
GAS
ETC.

OFFICIAL ORGAN of
The Illuminating Engineering Society
(Founded in London, 1909; Incorporated 1930)
and of
THE ASSOCIATION OF PUBLIC LIGHTING ENGINEERS
(Founded 1923; Incorporated 1928)

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Recent Developments in Gas Lighting — Problems in Illuminating Engineering — Annual Dinner of the Illuminating Engineering Society — Illumination and Sport — A "Castle of Light" — News from Abroad, etc.

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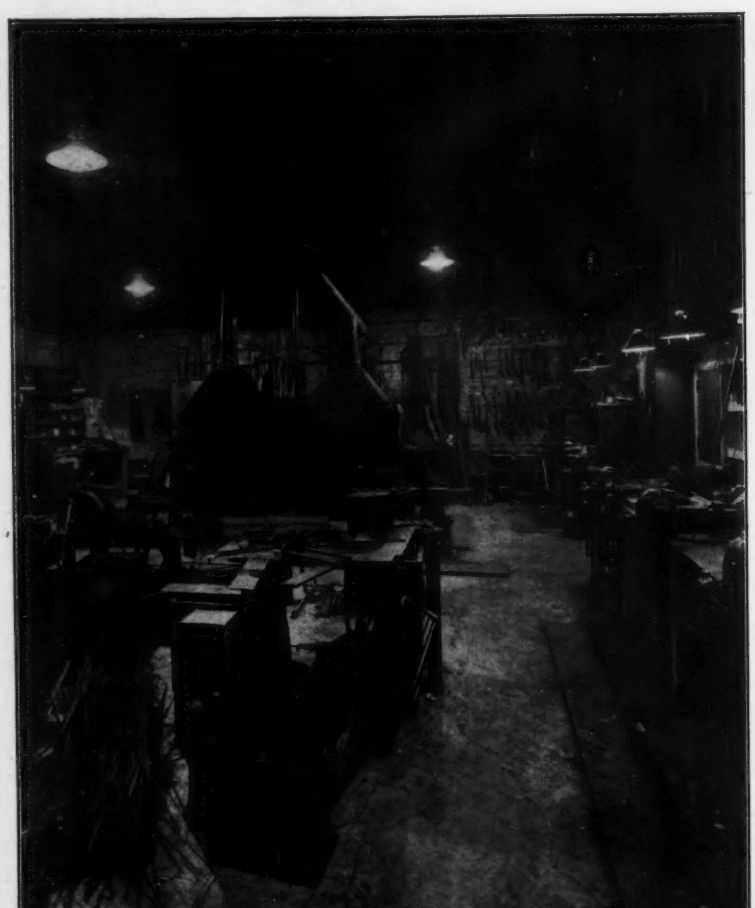

This Smiths' shop is perfectly lighted by modern low-pressure gas burners. The general lighting is effected by 5-light gas lamps, with super-heaters and enamelled steel reflecting shades. Over the benches (some of which can be seen on the right) are single-burner lights with deep conical reflectors. Over the machines are single-burner lights on swivel arms. Illumination on the working surfaces of machines is never less than six-foot candles. It can be varied, of course, by alteration of the positions of the lighting units. The average illumination on the benches is 9·3 foot-candles.

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Edited by
J. STEWART DOW

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Recent Developments in Gas Lighting

ON pages 55 to 62 readers will find the full text of Mr. Oughton's paper on the above subject, read before the Illuminating Engineering Society, on January 12th. For some reason papers on gas lighting are not easy to secure nowadays. Mr. Oughton, it was conceded by everyone, discharged his task well, doing a good service both to the Illuminating Engineering Society and to the gas industry. The paper was supplemented by numerous exhibits of the latest types of lighting fittings. It came as a surprise to some of those present to find how closely some of the methods adopted in electric lighting can be applied to gas. Among recent developments mentioned were the ventilating ceiling fittings with diffusing bowl, the "strip" lantern, the prismatic glass plates for use with street lanterns and the industrial fittings approximating to the standard electric type. Much interest was also expressed in the latest form of positive switch. If another promised development, the production of a direct-acting distant control switch eliminating the use of a by-pass, should prove a practical proposition, this will be a noteworthy achievement; one evident limitation of gas lighting (the need for continuous consumption of gas through a by-pass) would be removed.

There was some discussion on the comparative methods of rating the luminous output of gas and electric sources of light. As Mr. Oughton pointed out, the problem is less easy for the gas industry as the number of variables in a lighting unit is greater and standardization is more difficult. It does seem, however, that the method of expressing candle-power adopted by some makers of fittings is not quite clear; we should like to see uniformity of practice for all sources of light, whether gas or electric.

Many of the speakers in the discussion were associated with electric lighting and they united in congratulating Mr. Oughton on his paper and in paying a generous tribute to his demonstration of what gas lighting can do. Such criticism of the methods of the gas industry as was expressed was constructive, and was received sympathetically by the author. There is, one finds, a general impression that the gas industry has concentrated attention too exclusively on the heating and industrial side applications, with the result that lighting has been neglected. Dr. Walsh emphasized the need for better educational facilities. Papers such as that read by Mr. Oughton are infrequent. Public lectures and attractive demonstrations of modern gas lighting, with imagination and ingenuity behind them, are not sufficiently in evidence. (One recalls the Exhibition at the White City in 1913 as an outstanding effort. Features on that occasion were the interesting examples of applied gas lighting in the home and in schools, churches, etc., and a series of lectures and addresses by experts on various aspects of illumination.) Dr. Walsh asked whether something similar to the E.L.M.A. Lighting Service Bureau, which has done such excellent work for electric lighting, could not be contrived for the gas industry. We see no valid reason against this step. Gas lighting doubtless does not lend itself to spectacular lighting effects in quite the same way; but it has a wide field of admitted usefulness, and its limitations are not so great as is apt to be imagined, even by some of those in the gas industry.

Demonstrations, however, only form part of such propaganda work. The success of the E.L.M.A. Lighting Service Bureau is due not merely to the clever displays that it stages but also to the fact that the lectures and articles it prepares are of broad educational value, illustrating the principles of good lighting and its advantages.

Naturally a corresponding organization for the gas industry might have to be conceived on somewhat different lines but in may respects its functions might be the same. It should have ample facilities for demonstration—not merely displays of the latest fittings, but illustrations of how gas lighting can be applied for the solution of special problems, such as the lighting of streets, schools, factories, etc. It should also organize lectures, both for those in the gas industry and for the public, dealing with applications of light and illustrating the benefits of good lighting.

One would like to see the old-established gas industry taking a more prominent part in educational work of this kind. We do not overlook the valuable work that the British Commercial Gas Association is doing for the gas industry, nor the enterprise shown by some of the leading gas undertakings. But it does seem that some sections of the gas industry, including some makers of lighting equipment, are strangely indifferent to the value of publicity, both direct and indirect. "Out of sight, out of mind" is a true saying. Gas engineers, therefore, cannot afford to let their lighting, the outward and visible sign of the existence of their industry, dwindle away.

Lighting for Effect

IT is often said that in many fields of lighting "efficiency," in the sense of minimum loss of light, and economy are of little moment. In large stores and places of entertainment lighting plays such a direct part in attracting custom and has such an important influence on sales that owners do not mind, within limits, what they spend on their lighting provided the desired *effect* is obtained. One finds in such cases a tendency towards what would ordinarily be considered extravagance in lighting—as illustrated by the phenomenal consumption of electricity by certain luminous canopies recently erected. "Effect" in such cases includes "brilliancy."

Those responsible for framing recommendations on lighting for working conditions naturally seek for a scientific justification for higher values of illumination. They ask, and with reason, "Why must we insist on a minimum of five or even ten foot-candles now—whereas before the war two foot-candles was considered adequate and three liberal?" "What has happened to make a higher illumination necessary for the same operation?" This line of argument would be perfectly just if one was seeking to impose a legal standard. But as regards ordinary working conditions practice has already outrun theory. The standard has risen so greatly that an office receiving only two foot-candles appears miserably lighted, and would occasion dissatisfaction—even if it could be proved with scientific precision that two foot-candles is ample for purposes of vision. In establishing these new levels it is chiefly installations of the character referred to above, where expense is of little moment, that set the pace, keying the public mind to a higher order of illumination.

"Effect," however, does not always spell brightness. There are those who still see in evening an interlude between daylight and darkness, between mental activity and sleep, during which the mind and body are preparing for rest. One finds, therefore, homes in which the lighting is soft and the illumination keyed down to a low level. This conception of lighting is often allied with the desire to preserve an "old world" atmosphere. Architects have been heard to affirm that furniture and decorations of a past period ought not to be viewed by the bright illuminations of the present day; that the effect is most impressive when they are only partially seen by a soft and subdued light, resembling that of the age of candles when such styles were created.

"Effect" also may have much to do with colour. Everyone knows that the problem of using modified artificial daylight, so as to obtain approximately correct appearance of colours, is linked up with the task of avoiding the somewhat "cold" sensation such systems are apt to evoke, and that some method of introducing warmth is necessary. It has also been asserted that "correct" appearance of colours is not always desirable; artists have been known to insist on their pictures being illuminated by mellow yellow light furnished by underrun glow-lamps, in preference to imitation daylight.

This view was quite strikingly illustrated in Mr. Oliver P. Bernard's contribution to the discussion on Problems in Illuminating Engineering at the meeting of the Illuminating Engineering Society, on February 18th (see p. 62). We shall deal more fully with this discussion in our next issue. Meantime we may say that, judging by one's personal impressions at the International Exhibition of Persian Art, the use of coloured illuminations—in most of the rooms of a rosy hue but in some cases yellowish—was justified. No doubt the exact colouring would have been more faithfully portrayed by artificial daylight. But the chilly effect of such a system on the public mind might have acted as a discouragement and the appearance of the famous carpets under the warm and romantic light provided was doubtless much more attractive than would have been the case under white light.

Lectures to Architectural Students

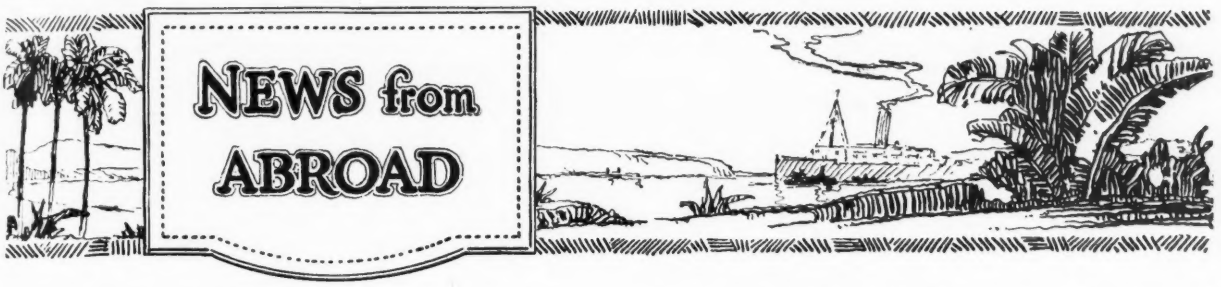
AS we half suspected, our note on the above subject in the last issue* has brought us letters pointing out the existence of other courses of lectures on illumination for architectural students. In commenting on the syllabus of lectures given by Mr. W. C. Clinton, at University College (London), we remarked that we could not recall similar lectures being planned at any other educational institution in the past. Mr. R. W. Maitland now writes to mention that the Architectural Association has for the past ten years had lectures on the Mechanical Equipment of Buildings and on Electric Light. We gladly record this to the credit of the Architectural Association. We imagine, nevertheless, that such courses in the past were less complete than the special series given quite recently for the Architectural Association by the E.L.M.A. Lighting Service Bureau, of which Mr. Maitland sends us the syllabus. The course, which has just been given to the "Upper School" of the Association, consisted of four lectures: "Fundamentals in Lighting" (Mr. S. Anderson), "The Consideration of Lighting Systems" (Mr. H. Lingard), "Special Lighting Problems" (Mr. W. J. Jones) and "Light and Architecture" (Mr. R. W. Maitland).

In our reference to educational institutions we were referring primarily to technical colleges rather than to such bodies as the Lighting Service Bureau, whose work in this field is well known. Our attention has, however, been drawn to another praiseworthy effort—the series of five courses which has been in use in the University of Liverpool for the last four years. These lectures are given in the Department of Applied Electricity and are attended by the students in the School of Architecture in their third year of study. The lectures, five in number, are illustrated by experimental demonstrations. The general syllabus is not unlike that framed by Mr. Clinton, but two lectures are given up to Interior Lighting, with the result that applications of light can be discussed somewhat more fully and room is found for such special subjects as the use of shadows to emphasize architectural features. One is glad to notice the importance attached to avoidance of glare, both in interior and exterior lighting.

We must congratulate the University of Liverpool on having been so early in the field. The course appears to be an excellent one; one possible addition to the subjects treated would be "Architectural Lighting," though this is perhaps a subject on which most of us would like to get our own ideas clear before imparting instruction to others!

Finally, we may recall that the courses mentioned above only deal with one side of the problem. They afford instruction in illuminating engineering for architectural students, but the converse process—educating lighting experts in the fundamental architectural principles—is equally desirable; we hope that steps in this direction will soon be taken.

* *The Illuminating Engineer*, February, 1931, p. 25.



Illuminating Engineering Society in France

ANNUAL DINNER AND GENERAL MEETING.

On January 22nd the annual meeting of the *Association des Ingenieurs de l'Eclairage* was made the occasion of a dinner at which the President, M. Maurice Leblanc, presided. M. Maisonneuve, on behalf of those present, tendered congratulations to the President on being created *Chevalier de la Legion d'Honneur*, a well-merited recognition of his devoted services to the cause of illumination.

At the subsequent general meeting M. Maurice Leblanc was re-elected President and M. Georges Andre Martin (who with MM. Dougnon and Salomon will continue in charge of the Bureau) as secretary.

M. Dourgnon recalled the main objects of the Association in establishing relations between lighting experts and outside specialists, such as architects, hygenists, etc., and gave an account of the work of the numerous committees now sitting. These committees are dealing, amongst other matters, with Fitting Design, Lacquers and Varnishes, and Diffusing Glasses and Surfaces. Two new committees, created in the course of the present year, are concerned with the precision of lighting calculations and photometric measurement, and with the standardization of industrial enamelled reflectors.

Industrial Lighting in Relation to Safety

An enterprising step recently taken in New Jersey, U.S.A., has been the giving of a series of lectures on the above subject to plant engineers, maintenance engineers and others concerned with industrial lighting. The first address, on January 19th, was given by Mr. R. E. Simpson, of the Travellers Insurance Company, who is also the Chairman of the I.E.S. Committee on Light and Safety.

Illuminating Engineering in Japan

The most recent issue of the journal of the Japanese Iluminating Engineering Society makes us regret once more the fact that its contents are presented almost entirely in Japanese script (though there is a manful attempt to present an English abstract of Mr. Kadokura's analysis of the effect of the intermittent light from a.c. arcs on the action of shutters in cinematograph projectors). Elsewhere we observe notes on the annual conference of the Association of Public Lighting Engineers, held in Leicester last year, and what is evidently a very comprehensive study of the history of photometers, by Mr. Z. Yamauti. The journal also contains at the end an exceptionally full record of recent articles and papers on illumination, optics, and several physical subjects.

The Illuminating Engineering Society of Australia

In our last issue we announced the formation of the Illuminating Engineering Society of Australia. We have since had the pleasure of a visit from Mr. E. W. Harmer, who was a member of the Council of the new Society, but now, having returned to England, becomes its first "Overseas Member." Mr. Harmer mentioned that the first annual meeting of the new Society was well attended and he anticipates that the new Society, whose by-laws are closely modelled on those of the Society in London, will make rapid progress. At present, meetings are being held once a month, but a branch society at Melbourne is already being contemplated. One would naturally like to do everything possible to foster a close relation between the two bodies. If a good proportion of members of the Australian body could become members of the Society in London this would be very helpful in maintaining intercourse. One can understand, however, that the payment of a double subscription is a difficulty. Perhaps some special arrangement for the benefit of "Overseas Members" might be possible.

Lighting Developments during 1930

The annual survey of progress in the electrical industry, presented in the January issue of the *General Electric Review* (U.S.A.), as usual contains some interesting notes on lighting. The aggregate of incandescent electric lamps sold in the United States during 1930 for once in a way shows a decrease—being 6½ per cent. below the figure for 1929. Apparently the number of standard lamps sold is only down by 3 per cent.; the chief drop, about 15 per cent., is in miniature lamps, a result that is fully accounted for by the depressed condition of the motor car industry and the reduced demand for headlights. An interesting development is the commercial production of 150, 200, 300 and 500 watt lamps with internally frosted bulbs. Another novelty is the "photoflash" lamp, which uses a bulb and base similar to those of the familiar 100-watt lamp but includes within the bulb several sheets of extremely thin aluminium foil, instead of the usual coiled filament, in an atmosphere of pure oxygen. A tiny 1.5 volt filament coated with a special material accelerates the start of the flash, which lasts for about 1-50th second. The lamp will burn equally well on voltages from 1.5 to 125 and is suitable for photographing single persons or small groups. Reference is also made to the hot cathode neon lamp and to new forms of low-power neon glow lamps and to the new "sunlamp" containing a tungsten filament, a pair of tungsten electrodes, and mercury within the same bulb. Amongst miscellaneous lighting developments we note illustrations showing the lighting of sports grounds on a large scale, some effective pictures showing decorative floodlighting applied to commercial buildings, and the use of the "Colorama" system for colour lighting.

Illuminating Engineering Society

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Election of Officers and Council Session 1930-1931

OFFICIAL NOTICE

IN accordance with the procedure specified in the Articles of the Society, a list of existing Officers and Members of Council, of vacancies occurring and of duly qualified persons nominated by the Council for vacancies about to occur in the offices of President, Vice-Presidents, Hon. Treasurer, Hon. Secretary, and Ordinary Members of Council, is enclosed herewith for the information of the Members of the Society.

In the event of any Members desiring to put forward other names, the Council will be pleased to receive such nominations, which should be made in accordance with the following rule (Article 48):—

> "After the issue of the Council's list, and not later than the *15th day of April* next following, any ten Members (but no more than ten) may nominate any other duly qualified person to fill any such vacancy by delivering such nominations in writing to the Hon. Secretary, together with the written consent of such person to accept office if elected, but each such nominator shall be debarred from nominating any other person for the same office at such election."

Present Officers and Members of Council	**Nominated by the Council to fill Vacancies**
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Sir JOHN HERBERT PARSONS, C.B.E., F.R.S.	
Mr. D. R. WILSON, C.B.E.	
Mr. C. C. PATERSON, O.B.E., M.I.E.E.	
Dr. J. W. T. WALSH, M.A., D.SC., M.I.E.E.	
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Lt.-Commander HAYDN T. HARRISON (1929)	
Mr. C. W. SULLY (1930)	
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Mr. A. W. BEUTTELL (1929)	
Mr. L. E. BUCKELL (1930)	Mr. J. ECK
Mr. H. BUCKLEY (1930)	
Mr. G. CAMPBELL (1929)	Mr. S. B. LANGLANDS
Mr. A. Cunnington (1927)	Mr. HOWARD ROBERTSON
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Mr. E. L. OUGHTON (1929)	
Mr. F. W. PURSE (1930)	
Mr. JOHN TERRACE (1930)	
Mr. H. Hepworth Thompson (1927)	
Lt-Col. W. A. VIGNOLES (1929)	
Mr. H. T. YOUNG (1929)	
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Hon. Treasurer:—*Mr. J. Wyatt Ife* (1909)	***Hon. Treasurer:***—Mr. J. WYATT IFE

The names in italics are those of retiring Officers or Members. The date in parentheses after each name indicates the date of election to Office or Membership of the Council.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Annual Dinner of the Illuminating Engineering Society

(Held at the Trocadero Restaurant, Piccadilly Circus, London, W.C., at 7-30 p.m., on Tuesday, February 10th, 1931.)

THE annual dinner of the Illuminating Engineering Society, which was held at the Trocadero Restaurant, Piccadilly Circus, on Tuesday, February 10th, 1931, was generally considered to be one of the most successful in the history of the Society. The attendance shown on the Table Plan, 195, was a record, even the number present at the twentieth anniversary dinner in 1929 being exceeded.

The President (Lieut.-Col. Kenelm Edgcumbe, T.D., M.Inst.C.E.) was in the Chair, and Mrs. Edgcumbe acted as hostess. Amongst those present were: Mr. H. V. Ashley (Vice-President of the Royal Institute of British Architects); Sir John Brooke, C.B. (Deputy Chairman of the Electricity Commission) and Lady Brooke; Mr. Harold E. Copp, M.Inst.C.E. (President of the Institution of Gas Engineers) and Mrs. Copp; Mr. J. S. Dow (Hon. Secretary); Dr. C. V. Drysdale, D.Sc. (Director of Scientific Research, The Admiralty); Mr. A. H. Dykes, F.C.G.I., M.Inst.C.E., M.I.E.E. (President of the Association of Consulting Engineers) and Mrs. Dykes; Col. C. H. Silvester Evans, O.B.E., T.D. (Hon. General Secretary of the International Illumination Congress); Mr. J. Y. Fletcher; Sir Francis Goodenough, C.B.E. (Vice-President of the Illuminating Engineering Society) and Lady Goodenough; Miss C. Haslett, C.B.E. (Director of the Electrical Association for Women); Mr. J. A. Horsley, O.B.E. (H.M. Electrical Inspector for Mines); Mr. R. Hyams (Director of "Education"); Mr. W. J. Jones (E.L.M.A. Lighting Service Bureau); Mr. W. M. Mason (British Commercial Gas Association); Sir David Munro, K.C.B., C.I.E., M.B., F.R.C.S. (Secretary of the Industrial Health Research Board), Lady Munro and Miss Munro; Lieut.-Col. H. Outram (Director of Aeronautical Inspection, Air Ministry) and Mrs. Outram; Mr. C. C. Paterson, O.B.E. (President of the Institution of Electrical Engineers) and Mrs. Paterson; Sir Joseph Petavel, K.B.E., F.R.S. (Director of the National Physical Laboratory); Col. Sir Thomas Purves, O.B.E. (Chief Engineer, Post Office) and Lady Purves; Mr. W. R. Rawlings and Mrs. Rawlings; Mr. C. W. Sully (Director of the Electric Lamp Manufacturers' Association of Great Britain Ltd.); Lieut-Col. W. A. Vignoles, D.S.O. (Director of the British Electric Development Association); Dr. J. W. T. Walsh, M.A., D.Sc., M.I.E.E. (Past President); Mr. Thos. Wilkie (President of the Association of Public Lighting Engineers) and Mrs. Wilkie; Mr. D. R. Wilson, C.B.E. (Past President) and Mrs. Wilson; Mr. and Mrs. H. T. Young.

The usual loyal toast having been honoured, Sir John Brooke rose to propose the toast of the Society.

"THE ILLUMINATING ENGINEERING SOCIETY."

SIR JOHN BROOKE, C.B. (*Deputy Chairman of the Electricity Commission*), in proposing the toast of the Illuminating Engineering Society, said that he understood the main duty of illuminating engineers to be that of providing the best possible light, and this was a very agreeable task as we all of us liked to be seen in the best possible light! He was glad that the technical and scientific side of lighting was stressed in the work of the Society; whilst the practical and commercial sides had their importance, they frequently led to rivalries which, although healthy enough, could not be regarded as an end in themselves. Sir John also referred to the common purpose of illuminating engineers, whatever the illuminant they were dealing in, and was glad to recognize the happy relations which existed between gas lighting advocates and those dealing with electric lighting within the Society, which provided a common ground for the discussion of ideals. He had noticed with interest that the gas industry had increased its output by 56 per cent. since 1920—(there had also been a little electricity used, but he would leave this for the moment!) He felt that one of the great common purposes of the illuminating engineering movement was to kill the belief that the darkness which had hitherto prevailed was something which must go on for ever. He referred, as an example, to a recent census of shop lighting, which showed that only 5 per cent. of shops in a district were lighted to a reasonable standard of illumination, and he also instanced street lighting as an example of the need for propaganda in favour of improved standards. Whilst one could not expect to see reproduced everywhere the very high standard of illumination prevailing in Whitehall and on the Victoria Embankment, it was necessary to stimulate public interest and secure reasonable expenditure on lighting in the streets. He looked forward to the time when our great arterial roads would all be illuminated, and reliance on motor car headlights would be considered as foolish as the lighting of a railway station by lamps attached to the porters' trucks.

Lt.-Col. Kenelm Edgcumbe, T.D., M.Inst.C.E. (*President*), whose name was coupled with the previous toast, replied. He remarked that this occasion might be regarded as the coming-of-age of the Society, and reminded members that it was now 22 years since the original dinner was held at which the Society was founded by the efforts of the late Mr. Leon Gaster, and that he believed there were four of the original enthusiasts in the room that night, amongst whom he himself and Mr. Dow (the Hon. Secretary) were included. There were now nearly 500 members of all grades, including a number of well-known experts on illumination in foreign countries. He drew attention to the importance of this year in the annals of the Society, owing to the forthcoming International Congress on Illumination, which he hoped would be well supported. Besides the business and scientific side of illumination, which had been referred to by Sir John Brooke, he reminded his listeners that the Illuminating Engineering Society dealt with lighting from the artistic side. An indication of progress was the growing tendency to regard the lighting equipment of modern buildings as an integral part of the architectural scheme. Illumination, however, had also its diplomatic aspect, which was sometimes of great importance. He believed that Sir Josiah Stamp had said that engineers spent 10 per cent. of their time in devising schemes and 90 per cent. in persuading other people to adopt them, and the Society was not unmindful of the necessity for exercising its persuasion diplomatically. In concluding, Colonel Edgcumbe suggested that it would be interesting for the members present to estimate the illumination given by the lighting scheme in the dining hall, and he proposed to offer a small prize for the nearest estimate. Mrs Edgcumbe, who thought that the personal impressions of the ladies present would be of more value than a scientific estimate, had also offered a prize for the best criticism of the lighting in ten words.

"The Guests."

Dr. J. W. T. Walsh, M.A., D.Sc., M.I.E.E. (*Past President*) proposed the toasts of the "The Guests," and said that it was particularly gratifying to the Society to have with them representatives of so many bodies incidentally interested in lighting. The scientific side was represented by Sir Joseph Petavel (Director of the National Physical Laboratory), whom they recognized as a pioneer because of his valuable work on ultimate standards of light. The architectural profession was represented by Mr. H. V. Ashley (Vice-President of the R.I.B.A.). They also welcomed Sir David Munro (Secretary of the Industrial Health Research Board), especially in view of the valuable research work on vision done by the Medical Research Council. Mr. Harold E. Copp represented the Institution of Gas Engineers, and they had the pleasure of welcoming Mr. Clifford Paterson in a new role, as a guest, seeing that on this occasion he was representing the Institution of Electrical Engineers as their President. He was very pleased to have the honour of proposing the toast, "The Guests," and would couple with the toast the names of Sir Joseph Petavel and Mr. Ashley.

Sir Joseph Petavel, K.B.E., F.R.S. (*Director of the National Physical Laboratory*), after thanking Dr. Walsh for his kind remarks, expressed his appreciation of the very wide field covered by the work of the Society, as illustrated in its *Transactions*. He felt he could not occupy their time by dwelling on these multifarious activities in detail, and he would merely congratulate the Society on its services in inaugurating a brighter era, as compared with the darkness of the Middle Ages.

Mr. H. V. Ashley (*Vice-President of the Royal Institute of British Architects*), in responding to this toast, also referred to the all-round work of the Society. Every form of illumination, gas, electricity and even oil could render service in connection with illumination. The Society had many problems to occupy its attention. The lighting of schools and libraries, and the avoidance of glare everywhere, were being studied. The floodlighting of exteriors of buildings had been, in many cases, very well done; he could not speak with equal satisfaction of illuminated signs, many of which were capable of improvement artistically. In such directions architects and illuminating engineers, acting in concert, could make their influence felt to good effect. It would be mutually helpful if lectures by lighting experts for members of the architectural profession, and vice versa, could be arranged; he felt sure that his own Institute would willingly co-operate in such an arrangement.

At the conclusion of the speeches members and guests were invited to enter their efforts for the competitions. The highly decorative and diffused nature of the lighting, effected mainly by rows of opal lamps behind tinted screens of wavy glass, but supplemented by wall lights using rings of pendant twisted glass rods, rendered it a good subject for descriptive effort, but imposed difficulties on guesses of the illumination. An impressive performance was the manner in which one of the walls of the dining-room presently sank into the floor below (carrying with it the wall lights still glowing), so that the entire space area of the dining room and the assembly room was available for dancing and conversation.

The Empire Room, with its original method of lighting, was of considerable interest to visitors, most of whom met in these pleasant surroundings for the first time since the suite had been redecorated. (It may be recalled that these rooms suffered damage from a fire on the night preceding the annual dinner of 1929, when members last foregathered at the Trocadero.)

Later on the President announced that the actual illumination on the table in front of him, as measured before the dinner, had been found to be 5.87. Sir Thomas Purves, with his guess of 5.78, came marvellously close, and was announced as the winner. There were, however, a number of other guesses very near to this, including, we understand, an estimate by Mr. Arthur Cunnington of 5.75. (One must not, of course, attach too much significance to the second decimal point from a scientific standpoint—but it was necessary to for the purposes of the competition.) The guesses, however, roved between very wide limits, the lowest recorded estimate being 1.8 and the highest 21.32 foot-candles. Most estimates were on the high side. The diffused and soft nature of the lighting was in itself deceptive, but the best efforts came from those who concentrated attention solely on the visual effect; those who proceeded indirectly by attempting to calculate the watts per square foot, as a rule, framed excessive estimates.

The ladies had been asked to compress their efforts within a narrow word limit. The winning couplet was that of Mrs. Beckett ("Light without spare—bright without glare"), though Mrs. Rawlings ("Lighting modern, sublimely subdued; bravo 'Trocadero,' greatly improved!") and Mrs. Read ("To decorate with light—is a notion very bright"), were adjudged good seconds.

Dancing continued until the party broke up about 11-30 p.m., and everyone agreed that the evening had been a great success.

Recent Developments in Gas Lighting

By E. L. OUGHTON, M.Inst.Gas E.

(*Paper read at the Meeting of the Illuminating Engineering Society, held at the British Commercial Gas Association, 28, Grosvenor Gardens, London, SW.1, at 6-30 p.m., on Monday, January 12th*, 1931.)

THESE notes are intended to be a review of recent progress and development in gas lighting, the latent possibilities of which have, it must be admitted, only been timidly exploited in the many spheres of illumination.

Though this paper is occupied with recent developments it must not be overlooked that the inverted incandescent gas burner attained a relatively high degree of efficiency about twelve years ago when the super-heated cluster type of burner was introduced. This advance has been dealt with in a very able and exhaustive paper presented to this Society in December, 1921,* by Mr. W. J. Sandeman, of Croydon.

Perhaps also it is well to bear in mind that since the introduction of gas for lighting, which occured over one hundred years ago, the B.Th.U.'s dissipated per candle-hour have been reduced from about 200 B.Th.U.'s in the flat-flame burner to 10 B.Th.U.'s in the modern high-pressure gas lamp, or a 2,000 per cent. gain in the effective utilization of heat units per candle-hour.

This indicates real progress in the history of gas lighting, but, of course, if viewed from the standpoint of the loss of heat units in the production of light, the ratio of light obtained compared with the heat dissipated is, in common with all artificial light sources, still very small.

There is a point with gas lighting which is often overlooked or misconstrued, because the heat generated in producing the light is not all wasted, for in its utilization it may be used to associate in useful service the sister sciences of illumination and heating and ventilation in efficiently lighting—in particular, the interiors of large public buildings, churches, halls, etc., by definitely assisting the ventilation, and also minimizing down-draughts where the plenum system of heating is not used.

This fact ought to be borne in mind by the independent consulting illuminating engineer when advising and preparing schemes, in appropriate circumstances.

There is a general tendency at the present time to persuade users of light to adopt very much higher standards of illumination for all purposes, yet I think there is a point when adequate light is given and beyond which it becomes a luxury and not available to the many on economic grounds.

Professor Darling, in his first Cantor Lecture, delivered at the Royal Society of Arts, on November 24th, 1930, stressed the importance of the scientific construction of the incandescent gas burner and particularly emphasized the super importance of the gas nipple or ejector having the small orifices correctly proportioned and microscopically perfect in their internal contour if a perfect flame is to be obtained under general working conditions.

The "Metro" gas burner, with fixed predetermined gas and air proportions, is constructed so as to meet these very stringent requirements. It is so designed that with the exception of a burner socket which is brazed to the pendant, the burner can be removed without having to unscrew any part, as the burner fits into the socket by means of a bayonet joint, so that with just a turn it can be removed for cleaning as easily as an electric bulb. The globe is supported by means of lugs which fit into grooves in the burner rim and so obviate the use of any screws. There are no gas or air regulating screws, the air ports and ejectors being set for a given pressure and calorific value.

These burners reduce maintenance cost to a minimum. The duty of these with a straight coal-gas of 560 C.V. and a burner pressure of 25 tenths W.G. is as follows:—

Burner Co's. No.	C. ft. per hr.	M.L. H.C.P.	C.P. per cu. ft.	Lumens per cu. ft.	(Lower hemisphere) Type of mantles
1	1.25	25	20	125	Bijou (No. 1)
2	2.5	50	20	125	Medium (No. 2)
3	3.75	75	20	125	Universal (No. 3)
5	3.75	110	29	184	3, No. 1 (super-heater)

Domestic Lighting.

The modern vogue in lighting fittings is very varied and consists of the panel, bowl, tubular and candle design. These are generally designed for either gas or electricity, with perhaps the exception of the ultra-futurist type imported from abroad, which after all is an acquired taste, and is the exception rather than the rule for general domestic lighting.

The types mentioned may be in pendant form and also for wall lights to supplement the light at the sides or the corners of the room and add to the decorative effect. For positions in the house exposed to draughts vitreosil globes are nearly always used.

An essential point in modern domestic gas lighting is switch-control, which has seen many changes in principle and practice during the last 20 years.

Though for the present gas switch controls all need a bypass, and there is much to be said in favour of the small flame as a night light in the bedroom, the gas industry is, however, looking forward to the fulfilling of promises made recently by certain makers to provide a reliable gas switch without a bypass. If this achievement is beyond the reach of private firms or individual

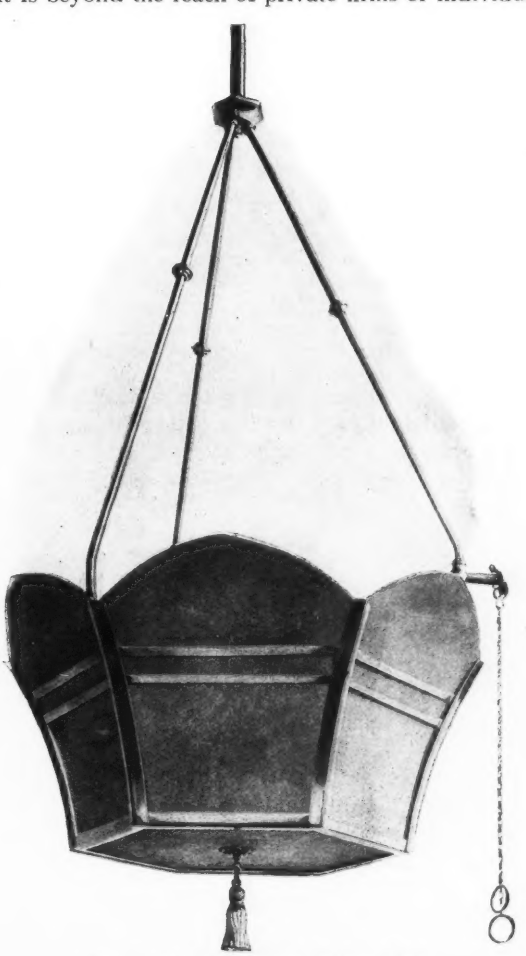


FIG. 1.—Panel Type Semi-Indirect Unit.

* *Illuminating Engineer*, January, 1922, pp. 7-22.

FIG. 2.—General View of "Positive" Gas Switch.

inventors, perhaps the Institution of Gas Engineers could obtain financial assistance, or, as has been suggested, offer a substantial prize for a practical solution of this apparently elusive problem, which could create a widespread interest amongst the research scientists of the world.

Once this objective is reached, there is no question that the use of gas lighting would be very greatly extended, and, with the increased use of smokeless fuel for domestic heating the bogey of dirty ceilings would be diminished, as there would then be a marked diminution of the solid impurities, soot, grit, etc., in the air which is directed to the ceiling by the heated convection currents.

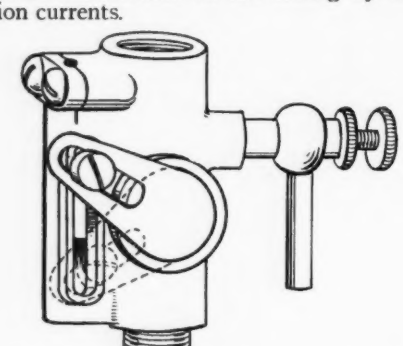


FIG. 3.—Gas Control Cock for Positive Switch.

THE "POSITIVE" GAS SWITCH.

This new form of switch is of the "positive" type, having a lever and slide action. It is operated by means of a 21 gauge nickel silver wire having a tensile strength of 100 lb. enclosed in a continuous coil of suitable heat-treated spring wire treated with graphite powder to obviate friction. This is then covered with a lead sheath so as to facilitate fixing to walls or embedding in plaster, running the cable round corners, and guarding against damp.

FIG. 4.—Cable Control for Positive Gas Switch.

The standard lengths of cable are from 6 ft. to 24 ft., though longer lengths up to 100 ft. are available. The plug of the gas cock is specially constructed and fitted to give a free-and-easy movement without allowing gas to percolate through the plug fitment at a pressure of 12 ins. W.G. If ordinary care is exercised in fitting this switch is really reliable and positive in action. An interesting feature of a bypass flame is that the maximum consumption at 30/10ths pressure W.G. is only 0.28 cubic feet per hour.

The Gas Light and Coke Co. have commenced a commendable scheme which will bring the standard of gas slot-lighting installations into line with the modern requirements of domestic lighting by supplying and fixing the latest design of shades, bowls and the "positive" gas switch control on extended terms of payment, in conjunction with the maintenance scheme already in operation. There is no doubt the adoption of this scheme will prove helpful to the development of gas lighting.

FIG. 5.—Example of Modern Gas Lighting (Edinburgh Gas Department Show House).

Manchester Corporation Gas Department, in particular, and other towns are adopting similar methods with great success, as the use of a gas switch removes all disabilities as to controlling the light in the room from a convenient point. Examples of modern gas lighting for the home have recently been brought to the notice of members of the Society.* The Edinburgh Corporation Gas Department have installed modern gas-lighting equipment of a very high order in their show-house.

(At this stage the author showed some slides of a south suburban Gas Company Showroom, illustrating effective artificial lighting of the interiors by ventilating lamps, and of the exterior by semi-indirect H.P. lamps concealed by facia.)

Also the London joint gas exhibit at the Ideal Home Exhibition and the Gas Light & Coke Co. and the South Metropolitan Gas Co. at the Building Exhibition for 1930 demonstrated that gas lighting can satisfy both the artistic and æsthetic sense, in addition to the general utility designs for the more prosaic taste.

CHURCHES AND PUBLIC HALLS.

Modern gas lighting for these types of buildings may be divided into three sections:—

(*a*) Ventilating lamps of high power, fixed to ceiling or ornamental ducts, directly connected to extractor ventilating cowls.

(*b*) Large cluster units fixed under but distinct from the ventilators, and may be fitted with raising and lowering gear for cleaning purposes.

(*c*) Separate superheated cluster units of varying size, according to the particular design of pendant and architectural details of the building.

Whether the large or small lighting units are used,

* *The Illuminating Engineer*, December, 1930, p. 304.

they are now—almost without exception—fitted with distant control, which enables the installation to be controlled either singly or in any sequence.

The degree of illumination in churches is often a matter of sentiment, but in public halls a minimum of 6 foot-candles is advisable.

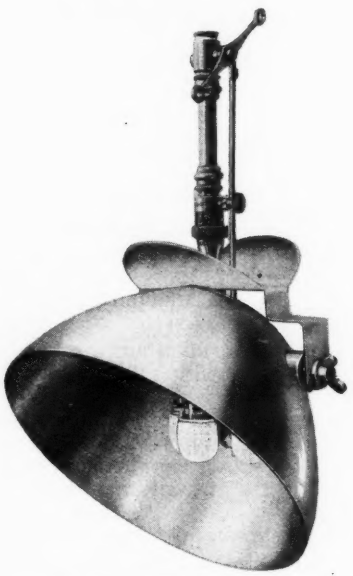
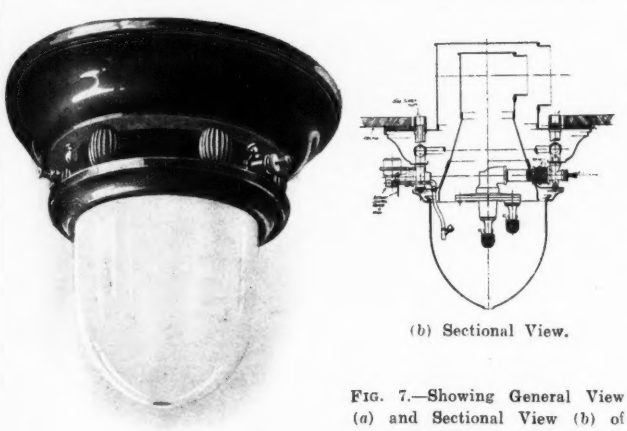


FIG. 6.—Directive Gas Burner.

These buildings are definitely favourable for gas lighting, for, in addition to lending itself to scientific illumination, as mentioned in the introduction, the adoption of gas lighting does materially assist in creating creature comfort by diminishing, and in many cases entirely eliminating down-draughts when the installation is correctly designed. For this reason it is advantageous to adopt large gas-lighting units for the main body of the church or hall, even if electric light is retained for under the galleries, etc., thus increasing the factors of comfort and reliability.

Mr. Robert Watson, Gas Engineer at Doncaster, relates an interesting case in point at the Corn Exchange Buildings, Doncaster, vide *Gas Journal*, March 26th, 1930, where six pendants fitted with 20-light clusters, giving approximately 6,000 candle-power, were installed and successfully eliminated down-draughts previously existing.

Another recent and interesting installation is the use of directive gas burners of approximately 300 candle-power each being used in Auchterader Parish Church to direct beams of light on to the altar and reredos*, and also to illuminate the war memorial in the Church of St. Andrew with St. Michael. The reredos is illuminated by concealed directive gas burners by



(*a*) General View. (*b*) Sectional View.

FIG. 7.—Showing General View (*a*) and Sectional View (*b*) of Ventilating Lamp.

* *Gas World*, December 27th, 1930.

the South Metropolitan Gas Company (of which a slide was shown at the meeting). This indicates yet another modern development in gas lighting which may be extended in other directions.

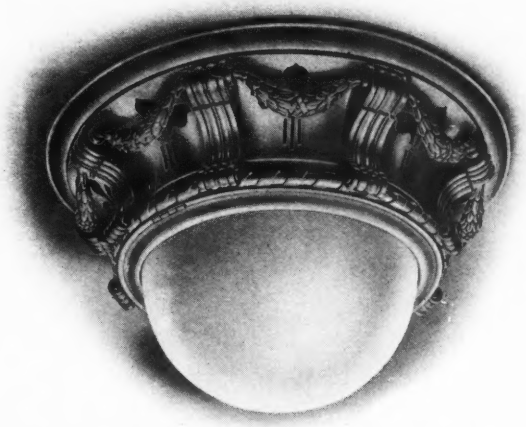


FIG. 8.—A Ventilating Lamp of somewhat larger size for use in halls.

Many public and church halls cater for indoor sports, badminton, etc., and modern gas burners in suitably planned batteries or units will give every satisfaction. While the particular method of applying the light may vary, two factors are constant, i.e., high illumination and absence of glare, or interference to the players' eyes within reasonable limits.

SCHOOL LIGHTING.

As school lighting is being considered by a committee, of which the writer is a member, it is not proposed to go into any details at present, beyond saying very definitely that up-to-date gas lighting can meet every requirement for the satisfactory lighting of schools.

SHOP LIGHTING.

Large Stores. As some of the large multiple stores with open counters displaying goods always instal the dual system in case of light failure, it seems opportune that the gas industry should avail themselves of the modern trend in design of fitting and adapt them for gas lighting and so make the emergency lighting part of the general scheme probably on a fifty-fifty basis and avoid having to use lamps, which though efficient yet mar the architectural scheme of lighting.

Also, the modern lighted ceiling panels are quite within the range of gas lighting with its positive control of the lights from the switchboard, and prismatic glass ceiling panels for operating rooms of hospitals, etc., are likewise within the scope of gaslighting now that heat-resisting glass is available. I would suggest that tests be made without delay to ascertain if there are any limits to the use of gas for this purpose where reliability is so essential.

Interior Lighting of Shops. Though the sphere of gas lighting is somewhat limited in the sealed window type of shop, there are many appropriate and familiar designs for general interior lighting.

Modern practice requires distant control of the lamps and for the larger units the standard distant control is used, and for the smaller ones the "positive" switch and the new type of distant control which is made stirrup fashion and fits directly on the pendant and controlled by a flush-fitting tumbler switch.

The use of these controls remove the old snag and deterrent of inconvenience of the past days.

As a matter of fact and importance, there are many trades, including grocers, where the warm convection air currents are a decided asset in keeping stock in a saleable condition.

Where the shop windows are not the sealed type the directive type of lamp is available either as a single unit or multiple unit directly connected to a ventilating shaft and with adjustable reflectors.

FIG. 9.—Modern Gaslight Fitting with Distant Control Device incorporated in the Pendant.

Outside Window and Parade Lighting. There are indications of a definite movement towards the increased use of outside lighting to attract the public to view the goods on show. It is also an asset to the shopping centres to have brilliant lighting as a permanent feature in addition to the street lighting.

The three general methods adopted are as follows:—

(*a*) High or low pressure gas lamps fixed in front of the windows at a height and distance from the ground and window respectively so as to give adequate illumination on the goods displayed.

Suitably designed reflectors fixed according to circumstances.

(*b*) Lamps of higher candle-power than (*a*) on front of building above the fascia.

(*c*) Lamps fixed on columns near edge of causeway (usually 12 ins. away) forming a system of parade lighting which may supplement the lamps on the shop fronts.

Modern practice is to control all lamps, whether high or low pressure, in groups or singly.

Low-pressure lamps may have the clockwork time controller fitted to cut out hand control altogether.

FIG. 10.—"Strip" Lantern.

The use of lightly frosted globes for the 1,000 candle-power and upwards high-pressure gas lamps improves the diffusion and gives quite a pleasing effect.

The relative duty of the high and low pressure superheated lamps respectively on the M.L.H.C.P. rating and the B.Th.U.'s basis per candle-hour is approximately:—

High Pressure:
10 B.Th.U.'s; 300 lumens per cubic foot.

Low Pressure:
16-18 B.Th.U.'s; 190 lumens per cubic foot.

A new design of low-pressure gas lamp for shop fascia and hoarding lighting is the "strip" lantern, which is rectangular in shape and has up to sixteen mantles in a row and is fitted with an adjustable reflector.

FACTORY LIGHTING

It is generally accepted that the deplorable lighting conditions found in many factories is primarily due to the apathy of those controlling same, due to the absence of definite regulations compelling improved lighting, and not to any particular system of lighting.

High-pressure gas installations are ideal for modern factories, and with its wide range of units—60 to 500 candle-power and upwards—conditions requiring varying degrees of local or general lighting can be satisfactorily and scientifically provided for with the higher standard of illumination now demanded if output is to be increased, quality of work improved and accidents avoided.

Low-pressure gas lighting has also developed its usefulness by the adoption of modern-design reflectors in enamelled iron which meet the B.E.S.A. reflector specifications; one is shown as used by the South Metropolitan Gas Co.

STREET LIGHTING.

Recent annual meetings of the Association of Public Lighting Engineers contain much data on modern street lighting which has appeared *in extenso* in the electric and gas technical journals, e.g., in the contributions by Dr. Thomas and Messrs. Bishop and Winstone, at Leicester, in 1930.

The general development in street lighting is to bring the standard of lighting in line with the B.E.S.A. specification, and the latest improvements may be said to be the utilization of ancillary means to increase the effective and directive power of the potential light available at the source. This does not, however, warrant the focussing of a ray on the "test point" to the detriment of the mean average illumination.

It is common knowledge that while the B.E.S.A. is based upon the minimum illumination at a given "test point," the U.S.A. and Continental authorities specify the average value of the total flux of light on the street.

The more recent methods adopted for increasing the duty of street lamps are as follows:—

Prismatic heat-resisting glass refractors of various designs.

Silvered-glass mirrors.

Stainless-steel reflectors.

Chromium-plated steel reflectors.

Enamelled iron and aluminium reflectors of varying designs.

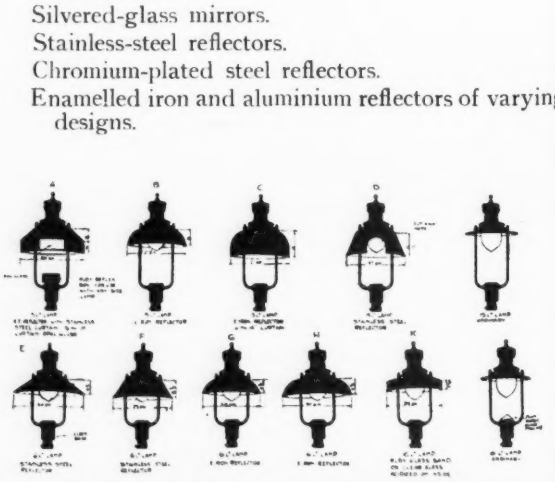


FIG. 11.—Various types of Street Lamps equipped with Special Reflectors (South Metropolitan Gas Company).

Some of the reflectors used with the "Metro" cradle lamps are as follows:—

(*a*) Enamelled-iron reflector with stainless-steel curtain; one-sixth of curtain is of opal glass and a ruby reflex box fitted at base of cradle, directly underneath the lamp.

(*b*) Shallow enamelled-iron reflectors, with curtain of ruby or clear glass acidized on inside.

(*c*) Dome-shaped enamelled-iron reflector, with a 4-in. curtain.

(*d*) Rustless-steel angular reflecting curtain, 7½ ins. deep, fitted on house side of lamp with plain mirror glass pyramids at base of cradle directly underneath the lamp.

These reflectors are made with varying diameters and depth to meet the particular duty for which they are designed.

Prismatic-Glass Refractors.

These recently designed prismatic refracting plates, as designed for gas lanterns, are now familiar to public lighting engineers. Amongst others, Mr. Robert Watson (Doncaster) and Mr. Grundfest, of Vienna, have recorded good results. From the slides and charts shown it will be seen that the directional control of the beam at 15° below the horizontal gives an increase over the bare mantles at the same angle from 180 candle-power to 645 candle-power

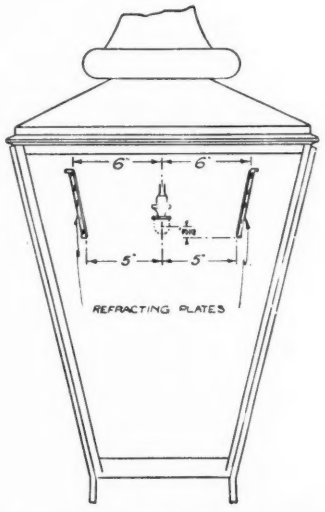


Fig. 12.—Showing use of Prismatic Refracting Glass Plate in Gas Lantern.

on the polar curve, without materially sacrificing the light at other angles in the lower hemisphere: some light from the upper hemisphere being directed downwards.

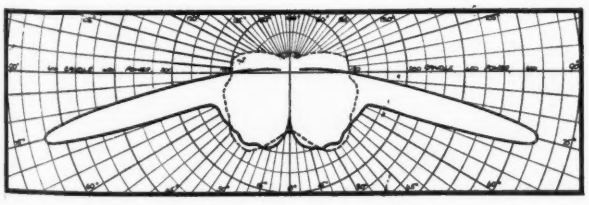


Fig. 13.—Improved Distribution of Light resulting from the use of Prismatic Glass Plates.

Circular Refracting Bands.

I am permitted to show you in advance to-night a further development of the plate refractor in the form of symmetrical and asymmetrical circular glass refracting bands, designed to fit inside the bowls of medium-size gas lamps. These bands are made in heat-resisting glass, and will be available in a few months.

Conical Refractors. The conical filter type of refractor which is now used in certain arc lamps, being placed at the bottom of the globe, will also be available for gas lamps.

. . . . . .

Recent developments in street lighting have been the great success of centrally suspended high-pressure gas lamps with traversing and lowering gears, which have received the unstinted approval of road users.

Larger units of both low and high pressure lamps on higher standards are being largely used, also with the lowering gear, to meet the demand for better street lighting.

The height-spacing ratio is governed by the type of road and designation of class, as per the B.E.S.A. specification.

Gas Signs. Doubtless much more might be done in connection with the application of gas lighting to luminous signs. A new field has recently been opened up by the application of gas lighting to an ingenious and effective form of device for lighting pictures, display cases, etc., recently exhibited to members of the Illuminating Engineering Society.*

Dog and Dirt Track Racing. Low-pressure gas has been successfully applied for these modern sports by the Brighton and Hove Gas Co. An illumination of 10 foot-candles is given on the "hare" and on the track a maximum of 11.9 foot-candles and a minimum of 7.3 foot-candles. Similar conditions were provided on the dirt track running parallel.†

Telephone Kiosks.

Many of the telephone kiosks are now illuminated by gas burners which are lighted and extended at pre-determined hours by means of clockwork-governed controls.

Future Developments.

If there is to be a regaining of the diminished gas lighting load and the retaining of that we have, it is necessary that the gas undertakings inaugurate through the B.C.G.A. a scheme for educating the public in the general principles of good lighting with the modern application of gas for this purpose.

This could be done by making surveys of various classes of industries, large stores and public buildings where gas can be used to advantage and by issuing technical data in readable form so that consultant and user may be convinced that gas is a modern lighting agent.

Finally, when gas lighting installations approach the ideal there will be a fading away of the line of demarcation between it and electricity, because then the light source will be less conspicuous when the resultant illumination is the objective. Personally, I believe gas lighting ought to be looked upon as a competitor in many fields where it is absent. This, of course, points to a closer development on parallel lines in designs of burners and fittings as the ideal is approached.

In conclusion I wish to make grateful acknowledgment of assistance and loans of apparatus and slides from The Gas Light and Coke Company, the South Metropolitan Gas Company, the British Commercial Gas Association and various manufacturers of lighting equipment; and especially of the help received from Mr. R. N. Lefevre, of Watson House, in arranging the switch control exhibit.

* *Illuminating Engineer,* December, 1928, p. 348.

† *Gas Journal,* October 24th, 1928.

DISCUSSION

Mr. W. M. MASON, who opened the discussion, said that the paper had been the occasion of an excellent demonstration of modern gas lighting. He need not try to add to what had been already so admirably stated by Mr. Oughton. Some pessimists thought, and wanted the general public and everybody to think, that gas was a back number for lighting, but any fair-minded man would admit after the demonstration that there was a lot to be done in connection with the application of modern gas lighting to modern needs.

He was surprised at the temerity of the Chairman in asking a gas man, particularly on the advertising side, to dare to put in a word, and he would refrain from saying anything controversial or anything that would offend the good friends on the other side. He would content himself with saying that from the gas point of view and the B.C.G.A. point of view Mr. Oughton had certainly given an admirable demonstration of good up-to-date gas lighting.

Commander HAYDN T. HARRISON congratulated the lecturer on putting forward the very best case for gas lighting. It had really been splendidly presented. He still thought, however, that electrical men would be given credit for doing much pioneering work and leading the way on the artistic side. Turning to the technical side of the question, he noticed that Mr. Oughton still adhered to the mean lower hemispherical candle-power as a base of measurement, and did not take the total output in lumens through the whole sphere. This procedure rendered it difficult to make a comparison between gas and electrical lamps. With electric lamps the output in the lower hemisphere was very much greater than that in the upper hemisphere, and no doubt this was the case with regard to gas lamps.

Whenever he heard a paper by a gas engineer he always asked for a little information on the question of the bypass. Mr. Oughton had not stated whether or not the bypass gas was included in the measurements. In the ordinary way the bypass was operated for 8,000 hours a year, and it was essential to know how much gas was actually used for the purpose. In the case of lamps used for lighting purposes for less than a thousand hours the proportion might be considerable. He would very much like to know at what minimum consumption a bypass would remain alight?

The question of the lighting of churches received special attention in the paper. That was a fascinating subject, but not a very commercial proposition. He understood from electrical engineers that the lighting of churches did not add much to the revenue. But the lighting effects possible in churches were often very beautiful. The assistance rendered to ventilation by gas lamps was a distinct advantage. In many churches the ventilation needed to be assisted considerably.

In regard to street lighting, he did not know how far gas engineers had succeeded in focusing the light on the "test point" as defined in the B.E.S.A. specification. There should be an endeavour to get the illumination at the test point somewhere within reasonable measure of what it was under the lamp. It would be found that by using a directive system in which the illumination at the test point was accentuated by prismatic plates or other means, the illumination was rendered much more uniform. If they could take the upper hemispherical light and direct it towards the test point half-way between the lamps, the discrepancy would be greatly reduced. It was gratifying to hear that directive methods were now being applied to the lighting of streets by gas.

Dr. J. W. T. WALSH congratulated Mr. Oughton, and wished to thank him very cordially for his paper. Probably he (Dr. Walsh) was not alone in feeling that they had heard more in the last hour about the possibilities of modern gas lighting than they had learnt in the last five years. It was gratifying to recognize its vast possibilities. With regard to the last section of the paper, if there could be more education of the public and of technical men, and people could be brought to visualize those possibilities, it would do a tremendous lot for the cause of lighting in general.

There was, as members knew, an admirable Lighting Service Bureau in existence to give information about the latest developments in electric lighting. He had found it difficult to get similar information on the possibilities of gas lighting. He wondered whether Mr. Oughton and others present could persuade the British Commercial Gas Association to set up a Lighting Service Bureau to demonstrate what gas lighting could do. Such a bureau would be an enormous advantage to the industry, and certainly a great step forward in illuminating engineering.

He was rather like Commander Harrison in feeling a sense of discomfort in regard to the use of mean lower hemispherical candle-power. He had to think hard to see exactly what was meant. If the gas industry could be persuaded to take the total lumens they would all know better where they stood. Nowadays the lumen was the only thing that they could conveniently work with. Much educational effort has been expended in order to make the public familiar with the therm, and he did not suppose it would be beyond possibility to educate people with regard to the lumen.

Mr. A. CUNNINGTON supported what Dr. Walsh had said about the need for propaganda. Recently he had occasion to ask an architect where he wanted the lighting units placed. Gas was a better and less costly medium in that case. But when the architect heard that gas was to be used he said, "I give it up entirely. Gas fittings will not harmonize with the architecture, and it is farcical to ask me." The architect had recently designed another building very much on the same lines lighted with electricity. He asked the architect whether it would serve the purpose if he followed the lines adopted in that building, and the reply was "Yes, but I should be very surprised if you can." He (Mr. Cunnington) hoped, with the assistance of such a demonstration as had been given, to be able to convince the architect that the same effect could be produced with gas as was produced in the electrically lighted building.

With regard to the bypass, he would draw attention to the fact that it did not make a considerable difference if the bypass was used in domestic lighting, where the proportion of lighting hours was very small compared with the total hours in the year. In the case of an industrial installation with, perhaps, all-night lighting, and where the consumption of gas was very large per unit, the bypass question was a minor one. In particular, the consumption of gas with a high-pressure unit was so very much greater than that of the individual bypass that it was a matter of very little importance. If the period of domestic lighting was only 300 or 400 hours out of 8,000, the matter became more serious. That was all the more reason for looking forward to a switch that would do away with the bypass.

Dr. S. ENGLISH briefly expressed his appreciation of the paper, and alluded to certain familiar problems, such as occasional breakages of mantles and their effect on glassware, and the possibility of modifying the spectrum of light furnished by the incandescent mantle, so as to get nearer to daylight.

Mr. J. S. DOW also congratulated Mr. Oughton on his paper. He thought everyone must be impressed by the ingenuity with which devices familiar in electric lighting had been applied to the gas-lighting units exhibited. There was, he thought, no real reason why many such methods should not have been introduced simultaneously for both illuminants. But somehow the original feeling in regard to mantles seem to be to let well alone, instead of experimenting with directive and screening devices. Similar considerations applied to concealed lighting. There were many cases where almost exactly similar effects could be obtained from concealed sources, irrespective of whether they used gas or electricity. Even what was termed "floodlighting" could be done with gas lamps to a limited extent, though this was a more difficult problem in view of the difficulty in obtaining a source of small dimensions. He recalled once arguing with an old gas engineer on these points; the latter was all against concealed lighting. "If we screen the lights like that," he said, "no one will know whether it is gas or electric; if they

can see the mantle they know gas is there!" This confusion between lighting effects and the use of the illuminant as an advertising device might help to explain a certain reluctance to adopt more scientific methods; it was quite out of place to-day.

Mr. Dow endorsed what Dr. Walsh had said in regard to educational work. A bureau for gas lighting similar to that so successfully operated on the electrical side might do much to foster interest and encourage enterprise; he would also like to see the gas industry more actively interested in general educational work in favour of better lighting, as distinct from purely commercial propaganda; he felt sure that efforts in this direction, though at first sight less directly remunerative, would prove to be in the best interests of the gas industry in the long run.

Mr. MINCHIN remarked that the question of the breaking of mantles depends largely on careful testing. In a case that he knew of, there were controllers which automatically turned on and off every half-hour, and after months of use of six mantles no sign of breakage had appeared.

Street lighting involved many debatable questions. It would often be found that the darkest point of a street was not the B.E.S.A. test point. Owing to the polished nature of the road, the "darkest point" was often just beyond the lamp post, and not midway between the posts. But where there was a very large angle of incidence the reflection was very irregular. He doubted whether it was desirable to arrange the fitting so that the maximum candle-power was directed on the test point.

Mr. G. CAMPBELL complimented the author. One of the most important features in recent development work seemed to be the distance-control switch. Would Mr. Oughton explain this more fully? He believed that during the last twenty years there had been a number of switches introduced, but none of them had been very successful or permanent. The distance-control switch appeared to be such an important factor that without it many of the developments displayed that evening would be rendered much less valuable.

Mr. A. W. BEUTTELL also thanked Mr. Oughton. It was very gratifying indeed to see the gas industry producing beautiful and suitable forms of fittings. One or two of the speakers had felt that they must not say too much about gas, and Mr. Mason had even gone so far as to say that he might offend somebody if he said much. But the Illuminating Engineering Society had no prejudices and bestowed no favours, and he was sure that all the members were only too delighted to hear a gas paper. There were not enough of them. The Society existed for the purpose of gathering information, especially on the technical side. He thought that if anybody in the gas world read a useful technical paper it would receive an even more sympathetic hearing than an electrical paper would, if only because so few were presented.

Mr. C. E. GREENSLADE thought that there should be coupled with thanks to the lecturer congratulation to the Society for making efforts over many years to educate the public up to appreciating good illumination and being ready to pay for the necessary fittings. Gas no doubt could give extremely good results with such fittings as had been shown. In the gas industry it was not infrequently said that the public would not pay for the right type of fitting; in fact, it had been suggested that the fitting, the burners, the shade, and everything else, should be sold for 10½d! Well-designed prismatic glass fittings for gas had been known for many years and had been successful, but the difficulty had always been that the public would not pay the cost. He thought that great credit was due to the Society for what it had done towards bringing about a more enlightened view.

Mr. F. J. WALKER said that the steady work that the gas industry had been doing for a long time in the maintenance of lighting fittings ought not to be overlooked. He had been in the industry for twenty-seven or twenty-eight years, and during almost the whole of that time gas companies throughout the country had been constantly taking steps to see that consumers had good value for their money. Progress had certainly been made in the design of fittings and consumers had generally been guaranteed good results.

He agreed with what had been said as to the adoption of lumens. But he remembered that until quite recently it was quite usual to speak of "the half-watt lamp." When one recalled that particular description one was reminded of the saying about the pot calling the kettle black!

The PRESIDENT, in winding up the discussion, said that he thought that the Society was to be congratulated. He must confess that until that evening he himself had no conception of what gas could do. He was glad to see so many gas engineers present. He thought representatives of gas and electric lighting should pull together and try to impress on the public the value of good illumination. He was sure that the gas industry could do extraordinarily useful work in that connection, and he hoped that many of the gas engineers present would join the Society.

Mr. E. L. OUGHTON, in reply, remarked that the question of the mean lower hemispherical candle-power had been raised. He supposed that it would be admitted that they got the useful rays below the horizontal, and that the structure of the burner did not allow very much to go upstairs. He did not see why the figures should not be brought on to a par with the figures for electric lighting. He had mentally decided to convert all the figures for his students this year in order to see how matters stood, and probably the results would be given later in the Press.

As to bypass consumption, the switch that he had shown was so set that the figure was not more than 0.28. Under favourable circumstances in a house it could be put at a quarter of a foot per hour. That gave, roughly, about 10 therms. On the other hand, Mr. Cunnington had pointed out that such a figure could not always be taken as a basis, and that one should take the whole case in its various phases including the hours of lighting. In churches and chapels that were lukewarm, the meetings being very infrequent, probably the proportion of the bypass consumption was much higher than in the case where there were meetings every night in the week.

He appreciated what had been said with regard to the test point and the B.E.S.A. Specification. A blueprint which he had, and which members could inspect, showed that there was very little less in the effective angles below the horizontal. It was practically the same as the bare mantle. The top which was not utilized was cut off.

He appreciated what Mr. Cunnington had said about the architect, and he was glad that the point had been raised. He did not admit that modern gas fittings should only be used where electricity was not available. The idea was that they should be used where it was available, and an effort should be made to convince people that the gas industry really could do something.

What Mr. Minchin had said on the question of breakage of mantles and testing was interesting. He thought that where there was proper testing the results were very satisfactory. They could not expect to get from casual sources of supply the same value as in cases where definite tests had been made. Two or three years ago the South Metropolitan Gas Company had shown a daylight mantle at the Ideal Homes Exhibition. He did not know why much was not heard about it now, but he understood that such mantles could still be obtained from a well-known firm. At the request of a very large group of mills in the North, mantles were impregnated, not to cut out certain rays but to give a definite yellow tint, and the result was very satisfactory.

He thought that the reflector was chromium plated, but he was not quite sure.

With regard to the question of meagre propaganda, he must be careful, as Mr. Mason was present. (Laughter.)

Switch control had been mentioned. He had two types which he would switch on one by one. (Demon-

stration.) The one he was showing at the moment was absolutely positive in its action, and unless there was a draught there was no risk of its not functioning. There was no difficulty at all with the bypass with a steatite tip if there was ordinary periodical maintenance and cleaning. The pneumatic was satisfactory up to a point, but it was not positive. They were going to chase the electrical industry and follow it. People were now getting used to higher electrical bills and were ready to pay more for fittings. (Laughter.)

Added:—

As regards the suggestion that the total flux of light in lumens from gas lamps should be given, so as to be comparable with figures presented for standard electric lamps in the B.E.S.A. Specification, the difficulty is that the gas industry has, at present, no standard specification for lighting units. Each burner or lamp may be fitted with different sizes and numbers of mantles, and with a globe, bowl or reflector, and a separate calculation for each set of conditions would be required. The following are actual figures obtained with a lamp of the type illustrated in Fig. 9 (p. 58) but equipped with an opal bowl. The mean spherical candle-power, as calculated from the polar curve, was approximately 78.5, which is equivalent to 986 lumens. I am informed that a 200-volt 100-watt gasfilled electric lamp is rated at about 1,100 lumens, and a 75-watt lamp of similar voltage at about 750 lumens.

Problems in Illuminating Engineering

(Proceedings at the meeting of the Illuminating Engineering Society, held in the Lecture Theatre of the Home Office Industrial Museum, Horseferry Road, Westminster, S.W.1, on Wednesday, February 18th, 1931.)

A MEETING of the Illuminating Engineering Society, held in the Lecture Theatre of the Home Office Industrial Museum, Horseferry Road, Westminster, on February 18th, was devoted to a discussion on "Problems in Illuminating Engineering." Members assembled for light refreshments at 6-30 p.m., and the chair was taken by the President at 7 p.m.

New Members.

After the minutes of the last meeting had been taken as read the Hon. Secretary presented the names of applicants for membership, which were as follows:—

Ordinary Members—

Babb, Capt. T. G. S....Mechanical and Electrical Engineer, Air Ministry, 16, Holland Road, Kensington, London, W.14.

Davidson, G.....Audrey House, Ely Place, London, E.C.1.

Hopkins, N.....Lighthouse Engineer, 57, Vivian Avenue, Wembley, Middlesex.

Mansell, A.....Electrical Engineer, The Edison Swan Electric Co., Ltd., 123 Queen Victoria Street, London, E.C.

Neill Thompson, J.....London Representative of Bromford Tube Co. Ltd., 13, Victoria Street, London, S.W.1.

Wheelwright, P. P.....Electrical Engineer, The Edison Swan Electric Co. Ltd., 123, Queen Victoria Street, London, E.C.

Country Members—

Forsyth, R. C.....Mechanical and Electrical Engineer, Busselton, West Australia.

Nesbitt, F. G.....Sales Manager, Credenda Conduits Co. Ltd., Oldbury, nr. Birmingham.

Malone, J. O'Brien....Installation Engineer, Electricity Supply Board, 51, Belgrave Square, Rathmines, Dublin.

Palin, F. J.....Illuminating Engineer, 17, Swinbourne Grove, Withington, Manchester.

The names of applicants presented at the last meeting were read again and these gentlemen were formally declared members of the Society*.

Problems in Illuminating Engineering.

The President then called upon Mr. T. F. H. Marsh to present the opening item, i.e., a Method of Testing the Relation between Intensity of Illumination and Visual Capacity. The test involves joining by lines a series of numbered dots on a sheet of paper; the time required for this operation was found to bear a close relation with the illumination in foot-candles, and this was illustrated by a diagram.

Mr. J. H. Parker (Electrical Engineer, L.C.C. Tramways) then gave an illustrated description of the lighting of the new Kingsway Tunnel, the method of lighting the stations being specially original. Mr. Oliver P. Bernard, who had advised on the Lighting Arrangements at the International Exhibition of Persian Arts, then gave an interesting explanation of the ideas underlying the use of coloured light in illuminating carpets and other exhibits. Mr. H. H. Long next dealt with a technical problem, the Illumination of Furniture travelling on a moving belt during the spraying process. Mr. R. A. Ives discussed the Floodlighting of the Singer Machine Co's building, an exceptionally difficult problem by reason of the small space available for mounting projectors, and Mr. G. W. Golds gave an account of an unusual method of Lighting a Large Warehouse, used for paper storage, by means of travelling lighting units connected by flexible mains to certain points of supply. A message was read from Mr. H. R. L. Goring who expressed his regret that, owing to his indisposition, he was unable to be present and present his "Problem in Cathedral Lighting" as he had hoped.

The President remarked on the great variety of topics dealt with in the contributions presented. An interesting discussion ensued in which Mr. Belshaw, Mr. S. C. Climpson, Mr. J. S. Dow, Mr. H. H. Long, Mr. J. Eck, Mr. T. F. H. Marsh, Mr. H. C. Wheat and others took part. On the motion of the President a very cordial vote of thanks to the authors was passed with acclamation.

Announcement of Next Meeting.

In conclusion the President announced that the **next meeting** would be held in the Lecture Theatre of the Institution of Electrical Engineers (Savoy Place, Victoria Embankment, London, W.C.), at 6-30 p.m., on Thursday, March 19th, when a paper on **Domestic Lighting** would be read by Mr. H. T. Young.

(A full and illustrated account of these "Problems" will be given in our next issue.—Ed.)

* *The Illuminating Engineer*, February, 1931, p.38.

Sheffield Illumination Society

A party of about 20 members of the Sheffield Illumination Society, and others, spent an interesting and instructive evening when they paid a visit to the Weston Park Observatory, on February 2nd. Though the sky was extremely clear just before the party had assembled, the moon and stars became obscured by clouds, making observation difficult. There were, however, bright periods, during which it was possible to study the surface of the moon with the aid of the telescope, which had been previously explained by Mr. Cox, of the Museum staff. The method of checking the time by the Transit Instrument was afterwards demonstrated, and the members had an opportunity of examining the instrument.

A further visit has been arranged for those who were unable to participate in this first, and it is hoped that the conditions on that night will be a little more favourable for observation.

Literature on Lighting

(Abstracts of recent articles on Illumination and Photometry in the Technical Press)

In this number we commence, by request, a new feature, the publication of abstracts of articles of interest. It is proposed to classify these roughly under the following headings: I, Radiation and General Physics; II, Photometry; III, Sources of Light; IV, Lighting Equipment; V, Applications of Light; VI, Miscellaneous.

A panel of abstractors is being formed, and the following, whose initials appear under the items for which they were responsible, have already assisted in the compilation of abstracts for this number:— Mr. F. J. C. Brooks, Mr. H. Buckley, Mr. H. M. Cotteril, Dr. S. English, Dr. T. H. Harrison, Mr. C. A. Morton, Mr. G. S. Robinson and Mr. G. H. Wilson.

It is hoped that this new departure will be helpful to readers and to members of the Society. The present series, though not exhaustive, covers the period from January 1st, 1931, to date. In future, abstracts will cover the month preceding the date of publication.

When desired by readers we will gladly endeavour to obtain copies of journals containing any articles abstracted and will supply them at cost.—ED.

II—PHOTOMETRY.

1. Photometry and Illumination at the National Physical Laboratory. J. W. T. Walsh, *World Power, p.* 32, *January* 15*th*, 1931.

A summary is given of work on photometry and illumination in progress at the National Physical Laboratory, including the photometry of standard light sources and of various types of lighting fittings and equipment. Reference is made to the problem of glare in street lighting, which is being studied on behalf of the Department of Scientific and Industrial Research, to work carried out on daylight problems and to tests of the absorption of various types of window glasses. The use of photoelectric cells is mentioned.

C. A. M.

III—SOURCES OF LIGHT.

2. Ultra Violet Radiation from the Sunlight (Type S.1) Lamp. A. H. Taylor, *J. Opt. Soc. Am.*, 21, *pp.* 20-30, 1931.

This is a mercury-vapour-filled spiral tungsten incandescent lamp, which is held in a normal screw-cap socket and made to burn vertically. It contains a small pool of mercury, and when the filament is heated a highly concentrated mercury arc strikes between two electrodes 5 mm. apart. The lamp is thus a combination of the incandescent filament and the mercury vapour lamp. The bulb is composed of a special glass designed to transmit all the energy at 300 Mμ, and to cut out practically all that below 280 Mμ. The lamp has very high therapeutic activity and emits little of the harmful radiation which lies below 280 Mμ. A special transformer is required with this lamp which requires a current of 9 amperes at 33 volts for starting, and a current of 30 amperes at 11 volts after the arc has struck.

T. H. H.

3. Characteristics of a new Ultra-Violet lamp. W. E. Forsythe, B. T. Barnes and M. A. Easely *J. Opt. Soc. Am.*, 21, *pp.* 30-40, 1931.

Gives a detailed account of the construction and properties of the new S.1 ultra-violet lamp made by the General Electric Company of Nela Park, Ohio (see previous abstract).

T. H. H.

IV—LIGHTING EQUIPMENT.

4. Concrete poles in Germany and Sweden. Anon., *Electrician*, 106, *p.* 175, *January* 30*th*, 1931.

Photographs are given of concrete poles used for street lighting in Germany and Sweden.

C. A. M.

V—APPLICATIONS OF LIGHT.

5. Church Lighting. D. Spencer Jones, *El. Rev.*, 108, *p.* 273, *February* 13*th*, 1931.

The special problems encountered in lighting churches are discussed. High intensity units should be mounted at clerestory level, since from this point most of the daylight illumination emanates. Approximately one watt per square foot of floor area will yield three foot-candles at pew height, which figure should not be exceeded. Direct lighting is considered better than indirect; diffusing units should be avoided. An alternative system suggested is by means of wrought iron pendant lanterns hung in the body of the church. Various wiring systems are briefly dealt with.

G. S. R.

6. The Economic Lighting of Looms. N. Goldstern and F. Putnowky, *Licht und Lampe*, 20, *pp.* 5 *and* 25, 1931.

These are the third and fourth concluding sections of an account of an investigation into the economics of the lighting of looms. It is found that daylight visibility is approached by a battery of units lighting the threads from the side so as to produce relief by shadow. The distribution of illumination is illustrated and results are given showing the effect of illumination values on (1) increases in speed of working, (2) decreases in the number of broken threads, and (3) decreases in the number of faults in weaving due to the oversight of the weaver. The final results are presented on a financial basis.

G. H. W.

7. Organ Type Console controls Theatre Lights. Anon, *Elect. J. p.* 33, *January* 28*th*, 1931.

The article describes how 110 lighting circuits are controlled by grid-glow tubes from an organ type console, which can move about the stage or orchestra. (Maximum distance 40 ft.) Four scenes can be preset. The remote control gear is situated below the stage, so that no actual load is taken at the switchboard. Dimmers are controlled by hand or foot pedal as desired.

H. M. C.

8. Committee on Light in Architecture and Decoration. *Am. Illum. Eng. Soc., Trans.* 26, *p.* 13, *January*, 1931.

An interim report of this Committee makes the suggestion that architects in the future must consider the appearance of their buildings under both natural and artificial light. It is contended that the latter, when used decoratively, should not be merely an attempt to duplicate daylight. Nine illustrated descriptions of noteworthy installations in America are given.

G. H. W.

9. Code of Street Lighting. *Am. Illum. Eng. Soc., Trans.* 26, *p.* 15, *January*, 1931.

After an introduction survey, streets are classified according to their type and traffic requirements. Light traffic thoroughfares are defined as those which usually carry a maximum of not more than 500 vehicles per hour in both directions; medium traffic thoroughfares between 800 and 1,200; and heavy traffic thoroughfares more than 1,500. These figures are taken as referring to the hour of the week which carries the maximum traffic during the lighting period. The recommendations for the lighting schemes of the various classes of streets are carefully qualified and variations are permitted. The original article should be consulted for full details, but the following are recommended:— Minimum mounting height 18 ft., with a maximum spacing with this height of 150 ft., greater mounting heights and also the use of units overhung over the carriageway. The recommendations for the various thoroughfares are:—*Light traffic*, lamps 4,000 lumens, staggered spacing; *medium traffic*, lamps 10,000 lumens, staggered spacing; *heavy traffic*, lamps 10,000 lumens, double-side spacing.

In an appendix the minimum adequate average horizontal illumination for thoroughfares is stated to be 0.25 foot-candles. For residence streets the figure is taken as 0.05 foot-candles.

G. H. W.

10. Floodlighting from Ornamental Standards. W. T. Blackwell and C. Gallo, *Am. Illum. Eng. Soc., Trans.* 26, *p.* 39, *January*, 1931.

The use of floodlights mounted on posts on the kerb-line is described. These posts and units also serve for the purposes of street lighting. It is stated that buildings of heights up to 125 ft. may be floodlighted successfully by using this equipment. Data are given on 34 typical installations.

G. H. W.

11. Lighting for Outdoor Sports. J. A. Summers, *Am. Illum. Eng. Soc., Trans.* 26, *p.* 52, *January*, 1931.

Information is given on lighting schemes for tennis courts (15 kw. for a single court is recommended), golf practice courses, putting greens, bowling greens, etc. The lighting of a race track is described. It is stated that 5 foot-candles of well-diffused light is necessary. For boxing rings 100 foot-candles is considered necessary.

G. H. W.

12. Lighting of Outdoor Athletic Fields. F. D. Crowther, *Am. Illum. Eng. Soc., Trans.* 26, *p.* 61, *January*, 1931.

Lighting schemes for various athletic purposes are described. For baseball it is stated that 15 foot-candles on the infield and 8 to 10 foot-candles on the outfield are required. At least 175 kw. of energy are considered necessary. 8 to 10 foot-candles for football, provided from at least three locations of projectors on each side of the field, are considered desirable. 75 to 90 ft. towers are recommended. Side mounted units, giving 10 foot-candles are stated to be best for ice hockey. Methods of under-water lighting for swimming pools are described. 500-watt floodlight projectors with 40° spreader glasses at 20 ft. spacing are necessary. Approximately one watt per square foot of pool area should be allowed.

G. H. W.

13. Ultra-violet Boon to Poultry Industry. L. C. Porter and C. E. Egeler, *Light*, *p.* 34, *January*, 1931.

Small quantities of ultra-violet radiation can be obtained from incandescent tungsten filament lamps if special glass bulbs are used. It is stated that tests in America have shown that the use of these lamps will enable strong, healthy chicks to be raised indoors without the aid of sunlight, cod liver oil or other means of preventing rickets. It is estimated that ample ultra-violet radiation will be supplied from the two available lamps equipped with aluminium or chromium reflectors, calculated on the following basis:—

Hours exposure per day (24 hours)	Watts per square foot. 60-watt lamp	500 watt lamp
3	26	8
6	13	4
12	6.5	2

Economic considerations are also discussed.

G. H. W.

14. Developments in the Electrical Industry during 1930—Lighting. J. Liston, *Gen. El. Rev.* 34, *p.* 82, *January*, 1931.

Reviews progress in electric lighting in America during 1930. Incandescent lamps, hot-cathode discharge lamps, sun-lamps, airport equipment and installations are described.

G. H. W.

VI—MISCELLANEOUS.

15. A Study of Visibility and Fog at Malta. By J. Wadsworth. *Geophysical Memoir No.* 51. (*H.M. Stationery Office*, 1930, 1*s.* 6*d. net*) *reviewed in Proc. Phys. Soc. Lond.* 43, *p.* 118, 1931.

Observations were made at Valetta at 8 a.m., 2 p.m., and 7 p.m., from 1919 to 1925. It was found that coastal mist or fog is more frequent in winter than in summer and that it tends to disappear by mid-day. In the absence of fog, visibility extends to 30 miles at least; it is best in winter with N.W. winds and least in summer with E. winds.

T. H. H.

16. Materials used for Surface Work in Architecture considered with reference to Illuminating Engineering. M. Leblanc and others, *Bull. Soc. Fran. Elect. I.* (*5th Series*) *pp.* 33-60.

Report of the Committee on Materials used for Surface Work of the Association of Illuminating Engineers. This report is the first of a series and deals with the present state of knowledge on the subject with particular reference to the photometric properties of the various types of surfaces employed in buildings. The report is divided into the following sections: (1) General considerations, (2) The making of plane and curved surfaces, (3) Paints and varnishes, (4) Stonework and brickwork, etc., (5) Surface decoration, (6) Methods of measurements of reflection factors, (7) Study of granular and embossed surfaces, (8) Opacity and covering power, (9) Tables of reflection coefficients and (10) Conclusion, indicating the subjects which are to be considered in future reports.

H. B.

17. Heat-resisting Coloured Coating for Lighting Bodies. Anon., *Glashutte No.* 45, *p.* 827, 1930.

For the production of a durable coloured coating for electric lamps and illuminating units, the following process is suggested:—

Remove all grease, dip in a gelatine solution (about 11 per cent.), at a temperature of 30° to 40° C. (according to the size and type of lamp), dry, harden the gelatine layer by washing in a coagulating liquid, colour by an aniline dye solution, dry.

S. E.

18. A Method of Measuring the Amplitude and Frequency of Vibration of Bodies which may be Heated to Incandescence. Wilbur E. Meserve, *Rev. Sc. Insts.*, 2, *pp.* 47-48, *January*, 1931.

The paper describes a method of investigating the resonant frequency of incandescent lamp filaments. The author points out that the life of lamps which are subjected to mechanical vibration, as for example those used in trains or motion picture projectors, will be very considerably shortened if the frequency of vibration of the body to which the lamp is attached is equal to the natural period of vibration of any portion of the filament. In the method, a photo-electric cell with thermionic valve amplifier is used in conjunction with a stabilized cathode ray oscillograph.

F. J. C. B.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society and is based on outside contributions.)

Illumination and Sport

(Communicated by the E.L.M.A. Lighting Service Bureau).

THE application of electric lighting to sport, although regarded by many as a novelty, is steadily being recognized as a practicable and suitable medium. Its protagonists, and these are an ever-growing number, claim that in this very strenuous age every facility for the provision of exercise and recreation for man should be within every reach, and that no embargo should fall upon the individual owing to long working hours, or the awkwardly designed period of the day he may be called upon to labour in.

Physical fitness is not only a legitimate aim; it is a national necessity, an economic obligation. The utilization of electric lighting in the cause of national fitness, and the provision of amusement and recreation, has an important future, the full extent of which will in all probability suddenly fall upon the industry. The parlous condition of trade at the moment may be the reason why this media is not more widely exploited, but its future is, one believes, quite assured.

In surveying the field awaiting development and exploitation the subject naturally falls into two distinct and definite sections—indoor sport and outdoor sport.

What are the possibilities of these? Most people are familiar with what is already done for indoor sport or recreation—billiards, the bowling alley, tennis, squash racquets, skating, cricket practice, badminton, table tennis, midget golf, croquet, boxing, swimming-bath lighting; in fact, it is only when one contemplates for a moment or two that full realization of experiment dawns. All these are within the scope of the average township. The success or otherwise of each or any of these forms of recreation is almost entirely dependent upon the lighting installation, for where glare and shadows are, man will not be found twice.

A survey of the lighting installations in the various places devoted to the above-mentioned recreative games would reveal considerable inadequacy, and account largely for the complaints that reach the manager's office of the many clubs and institutions throughout the country. There are hundreds of clubs up and down the country where insufficient attention is paid to the lighting of the billiard rooms. In the better lighting of existing sport and recreation avenues there is a good illumination field, but the lighting of large areas in the open air, which means provision for more people to be engaged in the game, and a still larger crowd to be catered for who merely watch it, there is a newer field with very large possibilities.

At the moment a number of factors are warring to secure mastery. There are those who disapprove of night football, for instance, on various grounds. They object because Saturday afternoon is regarded as ample for the encouragement of such contests, or an occasional afternoon during the week. But the great working population are unable to secure more than the Saturday half-day, which, if wet, is a dismal and often ineffective affair. And the non-playing section of the race, particularly those who have played the game, played it well, and retain a desire to see those who do not suffer from *anno domini*, this by no means negligible section should in some measure be catered for, and an occasional night game would meet their requirements.

In England there is a distinct ban on night football by the F.A. In New Zealand, on the other hand, winter football by artificial light is already a regular affair. Commercially, night football may not be regarded by the pundits as economically sound, but it certainly does appear that advantage might be taken, indeed should be taken, of artificial light to promote amateur exercise and recreation, and to make such more possible on winter evenings.

The National Playing Fields Association complain that, in spite of all their efforts, there still remain some three million young people who are unable to play games because they have nowhere to play. If existing playing fields were provided with floodlights, quite a number of the non-playing young people would be immediately catered for, and at least the accommodation would be doubled. Surely electric lamps give a better and more certain light than the sun in winter?

In New Zealand it is complained that for Rugby football no method of lighting has yet been devised enabling "the game to be played in proper style." A New Zealand correspondent to one of our important dailies stated a short time ago that the game is subject to shadows, and although the field is effectively flooded with light, "the upper air is still darkness," and one gathers there has been some difficulty in keeping in touch with "high punts for a follow-up," and place kicks. Of course, these remarks apply to actual games only, for practice floodlights have been in use in New Zealand for the past eight years in all the playing codes—Rugby, League (Northern Union) and Association.

In America it would appear that such playing areas as the famous Rose Bowl at Pasadena, on the Pacific Coast, do not suffer from the limitation observed in New Zealand, for a uniform intensity of 8 foot-candles over the playing area is provided, and to a height of 50 feet.

But football is not the only game that artificial light is applicable to. In America outdoor night tennis is played on municipal courts from March to

December. Hockey is another game that is easily catered for, and golf, with its long stretches, has not deterred the lighting expert, and an excellent installation exists at the National Golf School, Nela Park. In this manner hibernation for lovers of sport is being deprived of its reign during the long winter nights. Badminton, bowls, croquet and lacrosse are other pastimes awaiting fuller exploitation.

It may be that until the tide of a new prosperity turns in favour of this country no great enterprise will be attempted in this direction; it is, however, a field of experiment, and a field fraught with all the possibilities of a real success.

A New Process of Poster Display

Readers may recall a contribution by Mr. A. Cunnington to the discussion of Dr. English's recent paper, in which reference was made to a new type of poster, fluorescing under ultra-violet rays, which is on view at Waterloo Station. The originators of this process have furnished us with the following description:—

"The Vivid-ad process of poster display is one which, whilst not interfering with the appearance of the poster when viewed by daylight, nevertheless enables it to be illuminated by ultra-violet light at night time.

The poster which is to be displayed by the Vivid-ad process is treated with special fluorescent bodies in such a way that the light emitted by these fluorescent bodies when excited by ultra-violet radiation is of the same colour as the corresponding portion of the poster when viewed by daylight. For example, a portion of the poster which is red by daylight emits a red fluorescence when excited by ultra-violet light.

The range of fluorescent colours employed has been greatly extended and developed, so that every colour and shade can be represented by its fluorescent counterpart. Portions of the poster which are pure white in appearance in daylight can also be made to emit a white fluorescence by night. The production of a body emitting a pure white fluorescence is, in itself, a new development.

The poster which has been treated with the special fluorescent preparations is mounted in the ordinary manner and if required for use out of doors, is coated with a waterproof varnish.

The usual source of excitation in a mercury-vapour lamp is a fused quartz burner enclosed in a special weatherproof lantern. The latter is provided with a window composed of nickel glass which is substantially opaque to visible radiations from the mercury-vapour lamp, but permits ultra-violet radiations of 3,000-4,000 Angstrom Units to pass with very little absorption. An alternative form of lamp consists of long nickel glass tubes in which the mercury arc is struck. This form of lighting is convenient for small pictures, but the intensity of the illumination is not so great as in the case of the fused quartz burners.

Owing to the fact that the treated posters are themselves emitting variously coloured lights instead of merely reflecting them, their appearance is far more beautiful when viewed by their fluorescent light than when they are seen by reflected light as in the daytime or by ordinary floodlighting."

ERRATA.

We regret to record a slip in the reproduction of Fig. 1 on page 33 in our last issue (February) to which our attention has been drawn by the author, Dr. W. M. Hampton. The figures on the abscissa representing the percentage of light transmitted have been reversed (0 reading 100 and 100 reading 0).

Royal Society of Arts

ANNUAL COMPETITION OF INDUSTRIAL DESIGNS.

A report on the Seventh Annual Competition of Industrial Designs, held by the Royal Society of Arts in 1930, has recently been issued. To those unfamiliar with this competition it may come as a surprise to learn the scale on which it is conducted. The number of competitors entering last year was 1,225, of whom 849 were students at Schools of Art. The number of designs submitted was 3,593, of which the great majority dealt with Textiles (1,502) and Advertising (1,177).

The item of chief interest to our readers was the prize offered by Messrs. Hailwood and Ackroyd Ltd., for the design of an Electrical Illuminating Fitting to occupy the central position in a room, with Wall Bracket Fitting to match, design in modern style. The entry was disappointingly small, but some good designs appear to have been submitted.

Particulars of the Eighth (1931) Competition are now available. Scholarships and prizes amounting to £1,600 are offered. There is again, in the Architectural Decoration Section, an opportunity for skill in the design of lighting fittings, prizes being offered for designs of a ceiling light for a restaurant, and for a cinema, and for electric light fittings for a lounge. We hope that the entries will be more numerous this year.

Full particulars of the competition may be obtained from the Secretary to the Royal Society of Arts, John Street, Adelphi, London, W.C. Intending competitors should apply to the Secretary between May 1st and May 8th for the necessary entry forms, the last day for the receipt of entries being May 22nd.

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Light—A Modern Conception

A lecture on illumination was given recently at the Acton Technical College by Mr. A. E. Iliffe (a Director of the Benjamin Electric Ltd.). Mr. Iliffe in the earlier portion of his address discussed the nature of light, and the response of the human eye to light of different quality and in varied intensity. The lecturer then briefly reviewed the various forms of artificial light which man has devised, particular attention being devoted to the evolution and modern manufacture of the electric lamp.

Here the lantern was called into service and the lecturer's further remarks were illustrated by an extensive series of pictures and diagrams. It was pointed out that, having obtained a luminous source in the shape of an incandescent electric filament, the next problem before the illuminating engineer was how to modify or direct the resulting light-rays so as to serve the needs of those engaged in different processes. For this purpose a range of reflectors varying widely in design and method of application is necessary. Mr. Iliffe described several of the main types, illustrating his remarks both by views of the reflectors themselves and by pictures of installations showing their specific applications.

"The general standard of artificial illumination in industry and commerce is surprisingly low," Mr. Iliffe remarked, "and it is a matter of frequent occurence to find an otherwise up-to-date progressive firm affording for its operatives either a 'dim religious light' in which rapid sight (and consequently rapid action) is impossible, or else, a direct or reflected glare which is, from a production standpoint, even worse."

There then followed a dissertation upon the "correction" of electric illumination whereby daylight conditions are simulated. At the conclusion of the lecture a series of questions, which indicated the keen interest taken by the unusually large number of those present, was addressed to the lecturer.

The Lighting of Traffic Obstacles

The use of oil lamps with ruby glassware for marking out obstacles to traffic, usually road excavations, is a usual but not particularly effective method of illumination. Such methods are necessary in the case of roadways where no electricity is available, but something better should usually be possible in electrically-lighted main thoroughfares of a city. An instance in point is afforded by the reconstruction work on behalf of the underground railways which is now proceeding at Hyde Park Corner. The section of road occupied is entirely fenced in, but—and this is a novel touch—the wooden fence is furnished with niches at intervals, each of which carries an electric lamp with ruby-sprayed bulb, fed from the local supply.

In some roadways other local possibilities of using electricity for lighting occur. In not a few cases market stalls have been equipped with electric lighting. As time goes on the need for current to feed illuminated traffic-way signals, directions, notices, etc., will become more and more usual.

There is also the question of floodlighting, illuminated devices and other forms of exterior lighting (which may not be exclusively private lighting) and the—in surburban streets—important question of the illumination of house numbers. Already in Germany the provision of illuminated house-numbers, fed by a current from the street mains and provided for householders at a small annual rental has been proposed.

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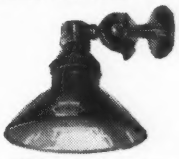

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EDISWAN LA78

The Castle of Light

A New Large Cinema Theatre in Berlin

By Dr. GERHARD SCHMIDT (Berlin)

IN the German capital a new large cinema theatre has been opened, in the construction of which light has been employed as an integral part of the architectural scheme.

This new example of lighting architecture lies in the north of Berlin, in that part of the city where the majority of the population are either workmen or small employees, for which reason the architectural effect is all the more impressive. The cinema is well filled, in spite of the fact that 2,200 seats are installed.

The night view of this building is excellent, especially the protruding part of the building façade above the main entrance, with its imposing corner turret (Fig. 1). Fifteen vertical luminous bands, 12 metres high, lead the eye upward towards the luminous name "Lichtburg" ("Castle of Light") in opal glass letters. Reaching out into the distance, and visible in a large section of Berlin, are the three beams of light from the triple-lens searchlight, equipped with a single 3,000-watt lamp. Each of the 15 band windows is divided up into 32 vertical rectangles, which are lighted up with 25-watt lamps installed behind the opal glass or opal-cased glass plates, and placed in rows at the right and the left-hand side of the rectangles.

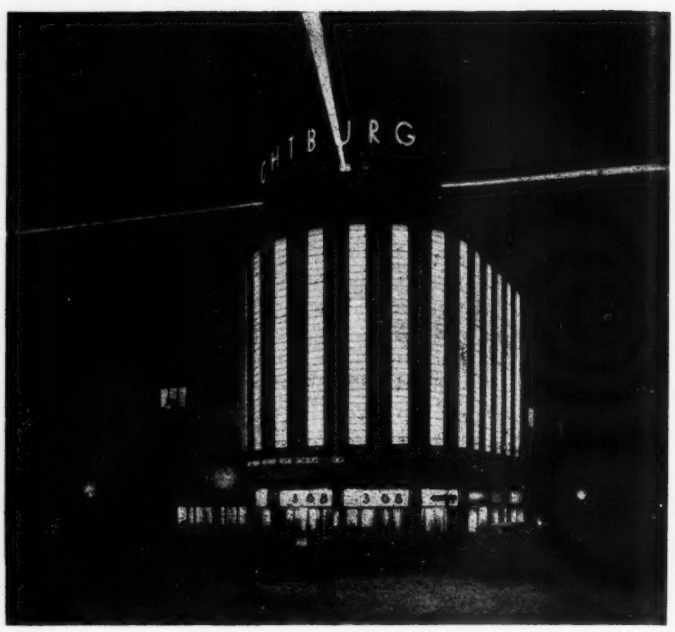

FIG. 1.—An Outside View of the "Lichtburg" Cinema in Berlin, showing spectacular lighting effects.

It would be impossible, within the space of this article, to attempt to describe the whole of this interesting lighting scheme, and one must be content to confine oneself to a few of its most important features.

The circular entrance hall, as well as the ticket office which lies in the centre of it, are indirectly lighted by 360 lamps of 15 watts each and 345 lamps at 25 watts. The auditorium receives the major part of its lighting from five indirectly illuminated rectangular sections built into the ceiling (Fig. 2), 3,160

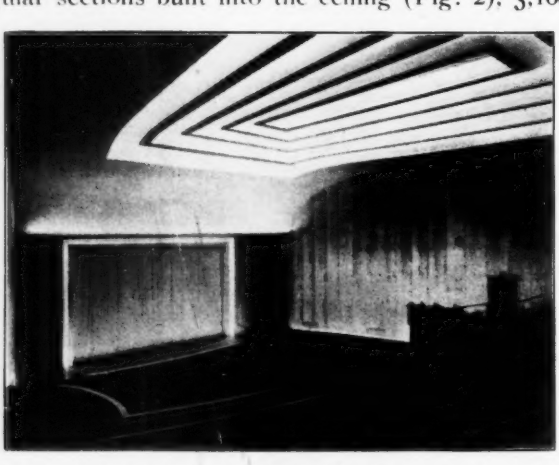

FIG. 2.—An Interior View, showing lighting by means of luminous bands inset in the ceiling.

25-watt lamps being installed for this purpose. In addition to this load of 79 kw., a further load of 3 kw. for the lighting-up of a luminous beam contained in the central rectangle must be added. The auditorium is tinted in red and silver-grey colours, and is especially well suited for creating the necessary light effects. The existence of white, blue, and red lamps renders it possible to mix the light in a similar manner to that adopted in general theatre lighting.

A band of light, in which 150 40-watt lamps are hidden, provides the necessary indirect illumination for the orchestra. The one-coloured, indirect illumination of the stage frame consists of 200 15-watt lamps. From the stage, leading to the two balconies, bands of diffusing glass illuminated by 135 15-watt lamps are used. The illumination provided for the floor space beneath the balconies represents a load of 5.4 kw.

For the stage lighting alone a total consumption of 57,200 watts are installed.

Although the theatre is chiefly intended to be a cinema, it should be remembered that short vaudeville acts between the "movies" or "talkies" are becoming more and more popular in the larger European cinemas; provision had therefore to be made for entertainments of this description. It was therefore necessary to install 75 gasfilled lamps of 150 watts each for the footlights and 100 150-watt lamps for the two rows of border lights. Four horizontal lanterns are each equipped with 3,000-watt lamps respectively, making a total of 12 kw. Six twin-mirror reflectors and four focussing reflectors are equipped with 1,500-watt lamps. There are four proscenium projectors with 1,000-watt lamps each. The bridge carries 4.25-amp. arc projectors, and two others are installed in the projection cabin.

To lighting experts and architects alike this building is a very interesting object of study, especially on account of the happy solution of the combined architectural and lighting problem. With the exception of the stage-lighting installation, the method of using a large number of small lamps in preference to a few large ones has been strictly adhered to, and this new cinema really gives the impression of "a castle of light."

This is only one amongst many interesting recent installations in Germany which illustrate the importance now attached to spectacular exterior lighting as a means of attracting public interest.

TRADE NOTES & ANNOUNCEMENTS

PUBLIC LIGHTING BY ELECTRICITY.

An excellent pamphlet bearing the above title has recently been issued by Revo Electric Ltd. There are a number of attractive pictures showing installations in streets, parades, public gardens, etc., both in this country and abroad. (We notice, incidentally, one showing the use of directional fittings in the Rotherhithe Tunnel.) There is also a representative series of street lanterns, prismatic glassware being especially prominent, though fittings equipped with "anti-glare" rings, band refractors and special reflectors of a directional type are also shown. A more ornate form of lantern is illustrated in the promenade lighting of the Marine Parade, Clacton-on-Sea; also interesting is the pillar unit terminating in an opal globe for use on bridges, Grosvenor Bridge, Chester, being thus treated. Numerous types of diffusing lanterns, special bracket lights, etc., are shown towards the end of the list (which contains 72 illustrated pages). A final useful item is the inclusion of designs for automatic traffic control and pillars carrying warning lights—both types of devices on which public lighting engineers are concentrating a considerable amount of attention at the present time.

SHOP LIGHTING.

The booklet issued by Benjamin Electric Ltd. on the above subject recalls the tests that are said to have demonstrated the "drawing value" of window illumination up to 80 foot-candles—an increase from 17 to the latter figure having resulted in 212 persons stopping to look at the window as compared with a previous 32 per hour—a 660 per cent. increase. The recommendations made in this booklet are, however, more moderate. In accordance with the usual Benjamin practice, suggestions for choice of equipment, spacing, etc., for various types of shops are tabulated. The illuminations recommended, according to the nature of the shop and its position, range from 10 to 20 foot-candles—conditions that are easily fulfilled. Useful equipment for shop lighting, including Bencolite fittings, show-case reflectors, and varous special reflectors for window lighting, is illustrated in the final pages.

THE BRITISH INDUSTRIES FAIRS.

According to reports the British Industries Fairs, both in London and Birmingham, have been surprisingly well attended this year, and more business has resulted than might have been expected in these days of depression. This only illustrates the truth of the saying that in bad times the great thing is not so much to cut down as to "get busy"—and go for the business. We hope in our next issue to give an illustrated account of some of the chief exhibits dealing with lighting. Before very long now we shall also be dealing with the Ideal Home Exhibition which, as usual, promises to include much that is interesting in the lighting field.

HOLOPHANE AT THE BUENOS AYRES EXHIBITION.

So much attention has been devoted to the British Industries Fair in this country that the British Empire Trade Exhibition, held in Buenos Ayres, is liable to be overlooked. It is hoped that this exhibition will have a stimulating influence on British trade, which will no doubt be aided by the Royal visit to South America. We are interested to hear that Holophane Ltd. is making a special feature of its display at this exhibition, many of the latest types of lighting units, such as the Hedralite and Pagoda forms, being on view. Holophane floodlighting units are also being used to illuminate the exteriors of some of the buildings of the exhibition. It would seem, indeed, that the Holophane Company must already be pretty well-known in Buenos Ayres, where, we are told, over 30,000 Holophane refractors are in use to light the streets.

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